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May
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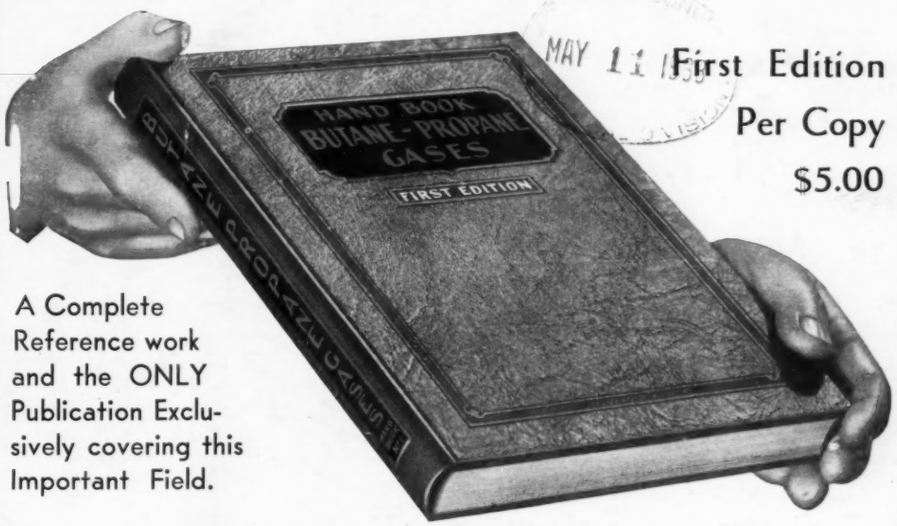

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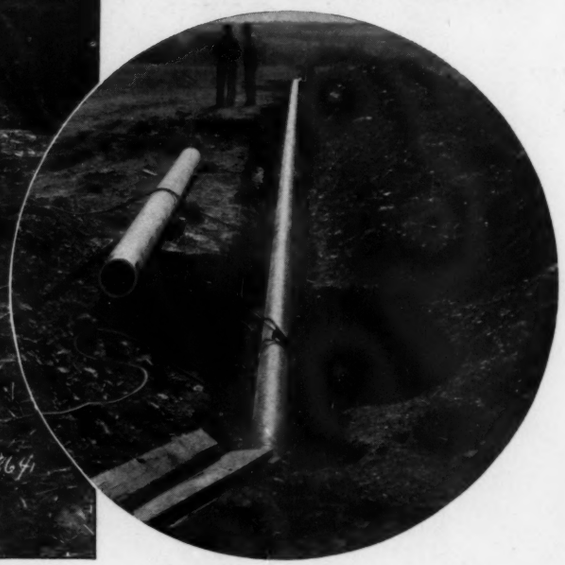

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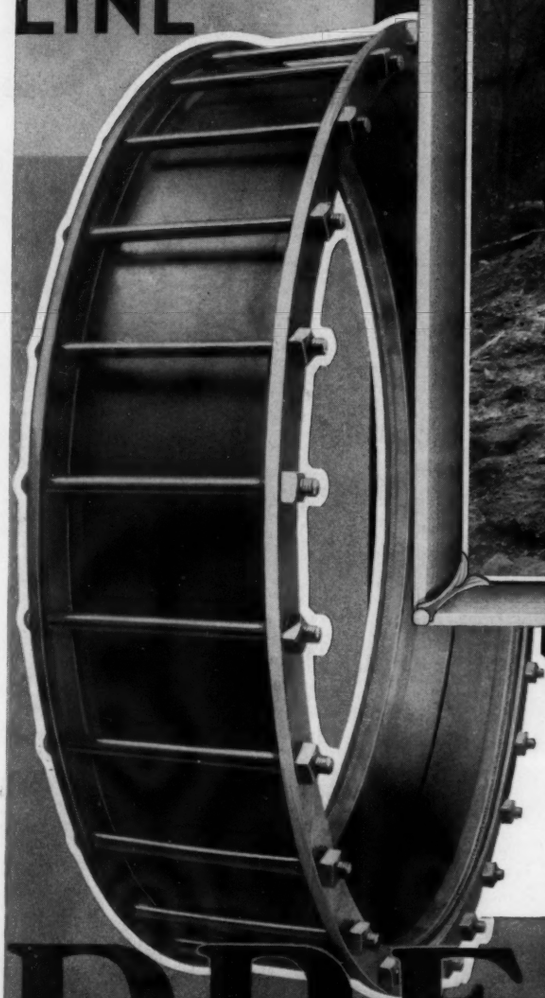

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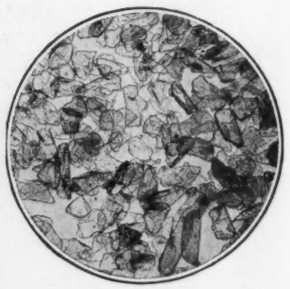

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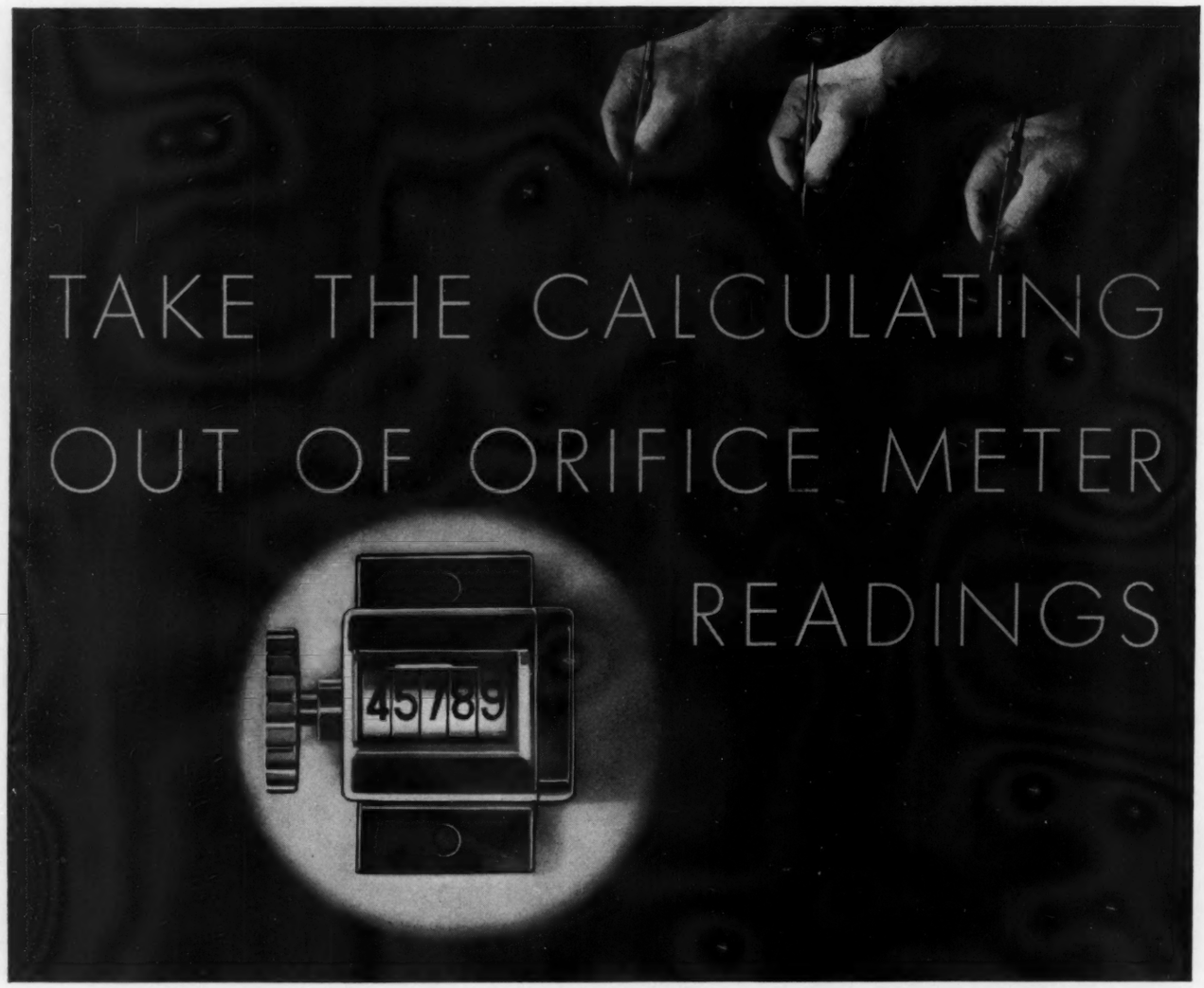

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May, 1933

WESTERN GAS

"Reg. U. S. Pat. Off."

A Monthly Journal of the Gas and Gas Appliance Industries in *Western America*

Vol. IX, No. 5

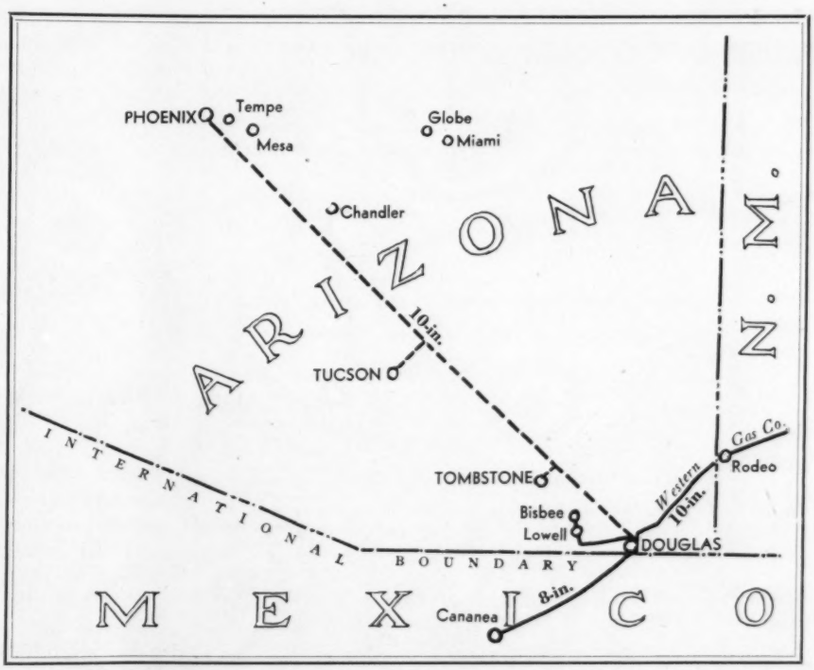
Service Areas Consolidated *by* 1932-33 Line Construction

By R. C. COLLING

News Editor, Western Gas

ANY review of natural gas operations for 1932 and the year 1933 to date must necessarily reflect the general economic conditions which have held the country in their grip for the period, but certain it is that the natural gas industry has been in the forefront of industrial activity, consolidating its newly won service area and bringing up reinforcements, and in not a few cases reaching out for new territory. Spring brings definite signs of awakening activity, with several new projects of major interest being announced for the coming summer months. Reopening of normal financing channels should bring forward a good deal of important line construction, including a large diameter carrier from Montana fields to Minnesota cities and another to Saskatchewan centers; the opening up of new Arizona territory for natural gas service, the addition of Wisconsin as a natural gas state with several hundred miles of line, and many other lesser projects.

The curve of natural gas trunk line mileage in the United States shows a steady upward trend in 1932, as indicated in the accompanying tables which give line completions for 1932 and the year 1933 to date, and also list lines which are now being planned by operating companies in the western territory. Location, mileage and diameter of each line are reported and cost figures given in some instances. An accompanying survey, listing newly served towns and those changed over from manufactured gas appears on Page 20 of this issue of *Western Gas*. Compilation of the tables was made possible through the cooperation of companies represented therein.



Sketch showing proposed route for new 10-inch carrier planned to serve Phoenix, Tucson and Tombstone, Ariz., shown as a heavy broken line. Solid line shows existing system of the Western Gas Co.

A high point of the year undoubtedly was the construction programs carried on in the Middle West by Northern Gas and Pipe Line Co. Natural Gas Pipeline Co. of America, Panhandle Eastern Pipe Line Co., and its affiliate Panhandle Illinois Pipe Line Co., the newly consolidated territory of these three organizations being shown in the map appearing on Page 8.

A state-by-state review of these 1932-33 developments follows.

From the standpoint of mileage, the new natural gas transmission line from Long Beach, Calif., to San Diego

GAS TRANSMISSION LINE CONSTRUCTION 1932-1933

Company	Line Location	Length (Miles)	Size (Inches)	Status; Gost
ARIZONA				
Western Gas Co.	From point 6 miles north of Douglas to Tombstone, Tucson, and Phoenix	216	10	Proposed Cost, $2,000,000
CALIFORNIA				
Gas Fuel Service Co.	Dudley Ridge Field to San Joaquin Valley towns	400	Small	Proposed
Industrial Fuel Supply Co.	Long Beach to Huntington Beach	10.5	16	Completed, 1932
Pacific Gas and Electric Co.	In San Francisco	7.7	26	Completed, 1932 Cost, $370,000
Pacific Gas and Electric Co.	Transmission line to plant in Kettleman Hills Field	3.3	16	Completed, 1932 Cost, $35,000
Pacific Gas and Electric Co.	Potrero gas plant to San Mateo line	7	26	Completed, 1932
San Diego Consolidated Gas and Electric Co.	Witherby St., San Diego to Rose Canyon	7.9	15½	Completed, 1932 Cost, $150,000
Santa Maria Gas Co.	North Bank of Santa Maria River to Oilport	20.22	8	Completed, 1932 Cost, $143,736.54
Santa Maria Gas Co.	Oilport to Avila	1.7	3	Completed, 1932 Cost, $6,061.17
Southern California Gas Co.	Orosi-Cutler extension	10	..	Completed, 1932
Southern Counties Gas Co.	From Huntington Beach to Rose Canyon, near San Diego	63	12¾	Completed, 1932 Cost, $1,000,000

was one of the most important projects begun and completed within the year. This 80-mile line was constructed of 12¾-inch pipe at a cost of more than $1,000,000 by Southern Counties Gas Co., Industrial Fuel Supply Co., and San Diego Consolidated Gas and Electric Co., the latter company also supplying the new fuel in its distribution area. The carrier was built along the shore line of the Pacific Ocean where the danger of corrosion is ever present, necessitating a careful soil survey, with cathodic pipe protection being employed in many sections.

Work on this line, which supplies natural gas to 17 towns with a combined population of 197,500, was begun on May 2, 1932, and completed August 26. Change-over operations brought natural gas to more than 57,000 meters, where the daily load on manufactured gas had been 2,500,000 M c.f.

A California development which natural gas men are now watching with great interest is the application of the Gas Fuel Service Co., of Los Angeles, newly organized, to serve gas in Kings and Fresno Counties. The gas would be

used for pumping and power purposes, as well as for supplying domestic demands in some communities. Should the application be granted by the California Railroad Commission, about 400 miles of small diameter pipe line would be constructed by the company. Supply for the carrier would come from the Dudley Ridge area in the Kettleman Hills field.

Northwest Line Completions

In the Pacific Northwest area several communities have been added to the list of new gas towns through line extensions.

Northwestern Natural Gas Co. of Seattle, Wash., extended its lines to serve Granger, Zillah and Toppenish, Wash., laying 20 miles of 6-inch pipe at a cost of $250,000. This company is also credited with plans for extending service to Pasco, Kennewick and other Washington cities in the future.

British Columbia Electric Railway Co., Ltd., across the Canadian border at Vancouver, B. C., is completing construction of more than 20 miles of pipe line, initiating service in Oak Bay, Saanich and Esquimalt, all suburban to Victoria, B. C., and served out of the Victoria plant.

Montana operations were very quiet during 1932, with no new gas area added. Plans of utilities operating in the western section of the state call for construction of a line to serve Missoula, Mont., with natural gas from the line from Cut Bank to Butte, operated by the newly organized Montana Power Gas Co. Northwest States Utilities Co. this month is reported to be beginning the reconditioning of its Missoula system, enlarging parts of it in preparation for the coming of natural gas with the return of normal business conditions. Montana Power Gas Co., organized in 1933 to operate the Montana Power Co.'s gas pipe line systems, is also reported to be planning to build a line to connect the Cut Bank-Butte carrier and the line extending north from the Elk Basin field now terminating at Livingston. This connecting link would be approximately 80 miles long and would supply the large cement plant at Trident, Mont., with natural gas in addition to the domestic load along the route.

A revival of plans for laying a natural gas line from the Bowdoin Field in northeastern Montana to Regina and Moosejaw, Saskatchewan, a distance of 176 miles, has been reported. Thomas McManus of Chicago is said to have taken over the plans abandoned by the Power Corporation of Canada and to have begun negotiations for franchises in Regina and Moosejaw. The program is reported to involve expenditure of $3,500,000 in developing a supply of

GAS TRANSMISSION LINE CONSTRUCTION 1932-1933

Company	Line Location	Length (Miles)	Size (Inches)	Status; Cost
CALIFORNIA—Continued				
Southern Counties Gas Co.	At Ventura	.5	16	Completed, 1932 Cost, $16,000
COLORADO				
Rocky Mountain Gas Co.	From field to Craig	3.5	..	Completed, 1932
ILLINOIS				
Central Illinois Natural Gas Co.	Field to Alexander	..	..	Completed, 1932
Illinois Northern Utilities Co.	Dixon to Polo, Mt. Morris and Oregon	25	4 3	Completed, 1932
Illinois Northern Utilities Co.	Main Chicago line to Mendota	3	10	Completed, 1932
Illinois Power Co.	Panhandle Illinois Pipe Line Co.'s Peoria line to Springfield	3	10	Completed, 1932 Cost, $4,000
Natural Gas Pipeline Co. of America	Main line near Taylor Ridge, to North bank of the Mississippi. 7 miles S. W. of Davenport, Iowa, including .7 miles of 8-inch lines across the Mississippi	4.3	8	Completed, 1933 Cost, $100,000
Natural Gas Pipeline Co. of America	Main 24-inch line to Galesburg	30+	8 or 10	Market Survey Being Made
Natural Gas Pipeline Co. of America	Geneseo Compressor Station to Illinois-Wisconsin state line	125+	16	Proposed
Natural Gas Pipeline Co. of America	From above line to Clinton, Iowa	20+	..	Market Survey Being Made
Panhandle Illinois Pipe Line Co.	Hannibal, Mo., to Quincy, Ill.	15	10	Completed, 1932
Panhandle Illinois Pipe Line Co.	Main line to Taylorville	10	6	Completed, 1932
IOWA				
Central States Electric Co.	Knoxville to Pella	10	..	Completed, 1932
Central States Electric Co.	Main line to Creston	6.8	..	Completed, 1932
Iowa-Nebraska Light & Power Co.	Texas-Chicago main line at Stennett, Iowa, to Red Oak and Shenandoah	26	4	Completed, 1932 Cost, $70,000
Natural Gas Pipeline Co. of America	Main line south of Muscatine to Muscatine	4.8	6	Completed, 1932 Cost, $45,000
Natural Gas Pipeline Co. of America	By pass lateral in Mills County, Iowa	1	12	Completed, 1932
Natural Gas Pipeline Co. of America	From Texas-Chicago Main line to Waterloo	80	8	Proposed
Natural Gas Pipeline Co. of America	Main line to Chariton	15	..	Market Survey Being Made
Natural Gas Pipeline Co. of America	From Texas-Chicago main line to Fort Madison, Burlington and Keokuk	75	..	Market Survey Being Made
Natural Gas Pipeline Co. of America	Clinton to Dubuque	50	..	Market Survey Being Made
Natural Gas Pipeline Co. of America	Main line to Cedar Rapids	40	..	Proposed
Natural Gas Pipeline Co. of America	Main line to Ottumwa, Fairfield, Centerville and Albia	100	..	Market Survey Being Made
Northern Gas and Pipe Line Co.	By pass lateral near Pacific Junction, Iowa	1	12	Completed, 1932
Northern Gas and Pipe Line Co.	Main line to Atlantic, Iowa	3.5	4	Completed, 1932
Northern Gas and Pipe Line Co.	16-inch main line to Forest City, Iowa	6.7	3	Completed, 1932
Northern Gas and Pipe Line Co.	From 20-inch main line to Eagle Grove	1	3	Completed, 1932
Northern Gas and Pipe Line Co.	From 20-inch main line to Clarion	3	3	Completed, 1932
Sioux City Gas & Electric Co.	From main line to Northern Gas and Pipe Line Co. to the Big Sioux Power Plant	7	16 14 12	Completed, 1932
KANSAS				
Argus Pipe Line Co.	Dodge City to power plant	5	..	Completed, 1932

GAS TRANSMISSION LINE CONSTRUCTION 1932-1933

Company	Line Location	Length (Miles)	Size (Inches)	Status: Cost
KANSAS—Continued				
Franklin County Gas Co.	Franklin County field to Ottawa light plant	1½ ¾ ½	6 3 2	Completed, 1932
J. J. Griffiths	Field to Moran	3	..	Completed, 1932
Fred Garrison & Associates	Wells to Parsons (additional supply)	14	..	Completed, 1932
Kansas Pipe Line & Gas Co.	Stanolind line to Valley Falls Junction	16.9	8	Completed, 1932
Kansas Pipe Line & Gas Co.	Valley Falls line	4.3	4	Completed, 1932
Kansas Pipe Line & Gas Co.	Stanolind line to Lecompton	1.5	2	Completed, 1932
Kansas Pipe Line & Gas Co.	Lecompton line to Perry	2.3	2	Completed, 1932
Kansas Pipe Line & Gas Co.	Stanolind line to Grantville	1.2	2	Completed, 1932
Kansas Power and Light Co.	Northern Gas and Pipe Line Co. main line to Beverly	3.5	2	Completed, 1932
Kansas Power and Light Co.	Northern Gas and Pipe Line Co. 26-inch line to Belpre	1.5	2	Completed, 1932
Kansas Power and Light Co.	Northern Gas and Pipe Line Co. 26-inch line to Holyrood	5	2	Completed, 1932
Kansas Power and Light Co.	Northern Gas and Pipe Line Co. 26-inch line to Claflin	7.2	2	Completed, 1932
Kansas Power and Light Co.	Northern Gas and Pipe Line Co. 26-inch line to Bushton	1.3	2	Completed, 1932
Louisburg Gas Co.	Louisburg	2¼	4⅞ to 2	Completed, 1933 Cost, $3,200
United Gas & Pipeline Co.	From Abilene to Solomon	9	4	Completed, 1932
Veeder Supply and Development Co.	Main line to Altamont	6	6 and 4	Completed, 1932 Cost, $13,000
Veeder Supply and Development Co.	Mound Valley to point 4 miles west	4	4	Completed, 1932 Cost, $6,000
LOUISIANA				
Interstate Natural Gas Co.	Loop line in Concordia Parish parallel to main line	5	22	Completed, 1932
MINNESOTA				
Northern Gas and Pipe Line Co.	From 16-inch main line to Austin, Minn.	22.1	8	Completed, 1932
Northern Gas and Pipe Line Co.	From Rochester 12-inch branch to Owatonna, Minn.	1	4	Completed, 1932
Northern Gas and Pipe Line Co.	From 16-inch main line to Interstate Power Co. line to Waseca, Minn.	1	3	Completed, 1932
Northern Gas and Pipe Line Co.	From Sioux Falls, S. D., to point on main line somewhere near Rochester take-off.	approx. 175	..	Market Survey Being Made
MISSOURI				
Missouri Power & Light Co.	Liberty, Mo. to Excelsior Springs	15	6⅝	Completed, 1932 Cost, $75,000
Panhandle Eastern Pipe Line Co.	Hannibal line to Palmyra	6	..	Completed, 1932
MONTANA				
Montana Power Gas Co.	Cut Bank-Butte line to Missoula	80	..	Proposed
Montana Power Gas Co.	Connecting line between the northern and southern systems	80	..	Proposed
Rom-Ed Natural Gas Co.	Armells field to Lewistown, etc.	25	..	Proposed
NEBRASKA				
Northern Gas and Pipe Line Co.	Main line to Feeble Minded Home, Beatrice	1	2	Completed, 1932

gas and building gathering lines. Another $450,000, or more, is to be spent in laying the transmission line, erecting compressor stations and distribution systems in Regina and Moosejaw.

The subject of natural gas service for Lewistown, Mont., has been brought up again, with the formation of the Rom-Ed Syndicate, by Lewistown men, to take over producing gas acreage in the Armells field and to construct a 25-mile line from the field to Lewistown, with laterals to serve a cement mill and a plaster mill nearby.

In Wyoming, natural gas operators have done very little in the way of new line construction, but have added some natural gas load through the reconditioning of an oil line extending from the Dutton Creek field to Laramie. Ohio Oil Co. put this 36-mile, 8-inch line into natural gas service. On completion of the work, early in 1933, Laramie, a city of 8,600 population was changed over from manufactured to natural gas. The company bought the interests of the Laramie Gas Co. from Associated Public Service Co. of Chicago, setting up new offices for the Rocky Mountain Gas Co., operating subsidiary of Ohio Oil. Rocky Mountain Gas Co. also inaugurated gas service in Craig, Colo., in 1932, through construction of a short line from fields near the town, establishing headquarters there for Colorado operations. This company is planning construction of a 22-mile 8-inch line from the Allen Lake structure in Wyoming, to the Dutton Creek-Laramie line, augmenting the supply for Laramie.

Lakota Oil & Gas Co. of Minneapolis, Minn., has announced plans for construction of a natural gas line from the Lakota field to Casper, Wyo., if the City of Casper purchases the system now operated by New York Oil Co. there. The City of Casper has entered into an agreement with the Lakota Oil & Gas Co. to purchase gas for municipal distribution over a period of 40 years.

Arizona's Proposed Carrier

Eyes of the western natural gas industry are now centered upon the Arizona territory, the cause being current reports of negotiations now under way between interests operating the 12-inch carrier from the Jal field in Lea County, N. M., to Bisbee and Douglas, Ariz., and the Reconstruction Finance Corp. in Washington, D. C. for the loan of $2,000,000. According to report the money would be used for construction of a line from a point near Douglas to Phoenix, serving Tucson and Tombstone, and possibly other population centers enroute. Application for the loan has already been filed in the name of the American Mortgage Co., and it is

understood that the loan would be secured by a first mortgage on the property of the El Paso Natural Gas Co., affiliated with Western Gas Co., operating the existing line. The new carrier would be 216 miles long, of 10-inch pipe, and would travel in practically a direct line from its origin to Phoenix. Central Arizona Light and Power Co. serves manufactured gas in Phoenix, through more than 12,000 meters.

Another development of interest particularly to New Mexico operators in 1932 was the construction by Southern Union Gas Co., Dallas, Texas, of a line from the Ute Dome gas field to Kutz Canyon field in northwest New Mexico. This 25-mile, 6-inch line connects these two fields, augmenting the supply available for Albuquerque and Santa Fe, and for Las Vegas, when the projected 65-mile, 8-inch lateral to that town is constructed.

120-Mile Line for Texas

Another line finding its source in New Mexico gas fields is the proposed carrier to be constructed by the J. W. Moore Construction Co. of Lubbock, Texas. The line as proposed will extend from the Hobbs field in the eastern part of the state, passing through Ropesville, Meadow, Brownville, Wellman, Seagraves, Eunis, and Seminole. Construction on this line was expected to begin before May 15.

In Texas, developments in 1932 have been confined chiefly to the southeast area, with the United Gas Public Service Co. leading from the standpoint of mileage of completed carriers. This company added 42 miles of line throughout the territory, and is now engaged in constructing a 12-mile, 10-inch line from the Van oil field to Mineola, Texas. Cost of this line is estimated by company engineers at $164,000.

Moran Gas Corp. of the South, Houston, added an interesting page to Texas' natural gas history by completing a line from the Conroe gas field, to Conroe, inaugurating gas service there, and a short line to Atchisonville. This company is now beginning operations on a 35-mile, 10-inch line from this gas field, which was discovered in 1932, to Houston, for the purpose of serving industrials there.

Add Middle Western Mileage

Pipe line operating companies in the Middle West drawing their gas supply from the Texas-Oklahoma-Kansas fields contributed many miles of transmission and service line throughout Iowa, Nebraska, Minnesota and Illinois, and plan several hundred more miles of construction if market surveys now being run

(Continued on Page 36)

GAS TRANSMISSION LINE CONSTRUCTION 1932-1933

Company	Line Location	Length (Miles)	Size (Inches)	Status; Cost
NEBRASKA—Continued				
Northern Gas and Pipe Line Co.	24-inch main line near Plattsmouth to South Omaha	16.2	16, 18	Completed, 1932
Northern Gas and Pipe Line Co.	From 6-inch branch near David City to Schuyler, Neb.	14.1	4	Completed, 1932
Northern Gas and Pipe Line Co.	From 4-inch line near Schuyler, to Columbus	14.7	8	Completed, 1932
NEW MEXICO				
Southern Union Gas Co.	Ute Dome Gas field to Kutz Canyon field, N. W. New Mexico	25	6	Completed, 1932
Southern Union Gas Co.	Santa Fe line to Las Vegas	65	8	Proposed
OKLAHOMA				
Independent Engineering Co.	Bebee field to Stratford	12	..	Completed, 1932
LeFlore County Gas and Electric Co.	Main line to Red Oak, for additional supply	16	6	Completed, 1932
TEXAS				
Houston Oil Co.	Main line to Dickinson	4 1.6	6, 4 2	Completed, 1932
Lone Star Gas Co.	Main line to Strawn field	2.1 1.1 2.8	12 10 8	Completed, 1932
Texas Electric Service Co.	Present line to Leon generating station	18	8	Completed, 1932
Empire Southern Gas Co.	Augmenting Brady supply	5	8	Completed, 1932
Moran Gas Corp. of the South	Conroe gas field to Conroe	3.2	4½	Completed, 1932 Cost, $15,000
Moran Gas Corp. of the South	Conroe gas field to Atchisonville, Texas	1.4 .8	4½ 3½	Completed, 1933 Cost, $5,500
Moran Gas Corp. of the South	Conroe to Houston, industrial	35	10	Under Const.
J. W. Moore Construction Co.	Hobbs field New Mexico, to Lubbock, Texas	120	8	Proposed
H. H. Shaw and Assoc.	Line from local field to Ozona, etc.	14	8	Proposed
United Gas Public Service Co.	Van Oil Field to Minneola, Texas	approx. 12	10	Proposed Cost, $164,000
United Gas Public Service Co.	Additions throughout the system	42	..	Completed, 1932
TENNESSEE				
Standard Gas Co., Inc.	Dickson County fields to Nashville, Tenn.	25	8	Proposed
WASHINGTON				
Northwestern Natural Gas Co.	Line to serve Granger, Zillah and Toppenish from existing line	20	6	Completed, 1932 Cost, $250,000
Northwestern Natural Gas Co.	Benton County to Pasco, Kennewick and Walla Walla	50	8 and 6	Proposed
WISCONSIN				
Natural Gas Pipeline Co. of America	Wisconsin-Illinois state line to to Milwaukee	40+	..	Market Survey Being Made
Natural Gas Pipeline Co. of America	From above line to Madison	60+	..	Market Survey Being Made
Natural Gas Pipeline Co. of America	Milwaukee to Green Lake, Sheboygan, Fond du Lac, Oshkosh, Green Bay, etc.	100+	..	Market Survey Being Made

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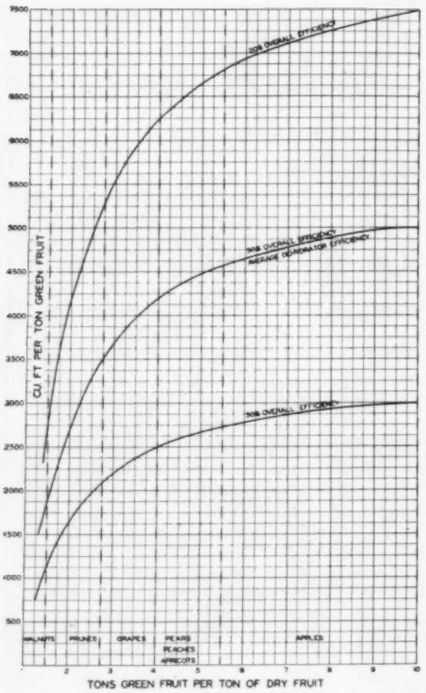


Fig. 1. Chart showing consumption of 1200 B.t.u. gas per ton of green fruit at 20 per cent, 30 per cent, and 50 per cent overall drying efficiency.

Gas *for* Dehydrator

builds summer sales curve

STUDIES were made as long as 10 years ago in the territory of the Pacific Gas and Electric Co. as to the possibility of using gas in dehydrators, but it was quickly developed that the high rates prevailing for manufactured gas in rural territories made the cost of its use exorbitant. However, an actual installation was made on an apple dehydrator where under the most favorable conditions it developed that the cost of the gas alone would amount to about 35 per cent of the gross selling price of dried apples. Fuel oil costs under the same conditions amounted to only about 7 or 8 per cent of the selling price. Obviously, a difference in cost as great as this puts gas out of the picture.

No further serious work was done on the use of gas in fruit dehydration in P. G. and E. territory until natural gas became available late in 1929. One or two installations were made that year and several more in 1930. The experience and knowledge gained from these resulted in a total of 32 jobs being on the lines in 1931, and 45 in 1932. These used in 1931 a total of 116,134,000 cubic feet, and in 1932 a total of 183,215,000 cubic feet, a 57 per cent increase even though there was about 30 per cent less gas used in prune dehydration in 1932 than in 1931. This reduction was due almost entirely to the demoralized dried prune market conditions, making it uneconomical for many growers to dry their prunes. Of course the bulk of prunes in California are dried in the sun, and it is estimated that those handled in driers amounted to only 25 per cent of the production.

In Table No. 1 is tabulated in Mc.f. the gas usage by months in 1931 and 1932 for the drying of apples, raisins, prunes, and hops and malt. The latter, although perhaps not a fruit in the strictest sense of the word, is an agricultural product and for our study is included in view of the fact that the repeal of the prohibition amendment will no doubt result in a considerable increase in the growing of this product.

A study of the gas output curve of the Pacific Gas and Electric Co. shows that the low months of usage by its regular domestic and commercial customers occur during the months of June to November, inclusive. The tabulation indicates the ideal nature of the dehydration load to fill in the valley in the load curve as practically the entire usage occurs prior to December each year. The data are from actual metered consumption of dehydrators operating in Pacific Gas and Electric Co. territory, and amply demonstrate the desirable nature of this load.

Some general comments on drying of fruit will no doubt be of interest and value to those who have not made a study of the subject. To go into detail would require a volume, and consequently no substantiating proof will be offered for many of the statements made.

Generally speaking, the drying of fruit involves the evaporation of water in various amounts, depending on the kind of fruit, the ripeness of the fruit, etc. Approximately 1,000 B.t.u.'s are required to evaporate one pound of water, whether this evaporation takes place at 100° F. or 212° F. This is a cold fact that is often ignored or overlooked in the dehydration of fruits, because practically all fruits are dried at temperatures between 125° F. and 165° F. At temperatures below 212° F. air has a definite and limited capacity for absorbing moisture, and the lower the temperature the greater the volume of air required to carry one pound of water. This means that in drying fruit it is necessary to heat air in large volumes, and, after it has absorbed some moisture, discharge it to the atmosphere. The heat lost in this way and the heat lost by radiation from the dehydrator, as well as the flue gas losses, make it almost im-

J. H. Gumz

TABLE NO. 1. GAS USED IN DEHYDRATORS (M c.f.) IN PACIFIC GAS AND ELECTRIC CO. TERRITORY

	Apples		Raisins		Prunes		Hops and Malt
	1931	1932	1931	1932	1931	1932	1932
June	.....	.....	.....	.....	.....	.....	3,451
July	7,070	2,719	2,216	.....	.....	.....	5,301
August	10,266	20,532	7,543	563	12,931	2,413	4,394
September	9,983	21,273	23,035	14,629	11,215	12,036	1,697
October	9,573	18,419	19,062	31,237	.....	1,926	.....
November	3,240	15,174	.....	23,331	.....	.....	.....
December	.....	4,120	.....	.....	.....	.....	.....
Totals	40,132	82,237	51,856	69,760	24,146	16,375	14,843

1931 Total—116,134 M.c.f. 1932 Total—183,215 M.c.f.

Fuel

By J. H. GUMZ

Industrial Gas Engineer
*Pacific Gas and Electric Company**

possible to obtain an overall fuel efficiency of over 50 per cent. That means that for every 1,000 B.t.u.'s supplied in the form of fuel a maximum of only 500 B.t.u.'s can be counted on in evaporating the water from the fruit. In actual practice many plants operate at as low as 10 per cent overall fuel efficiency, and, based on actual data covering a season's operation, it is probable that the better operated plants do not average much, if anything, over 30 per cent fuel efficiency over a season's run.

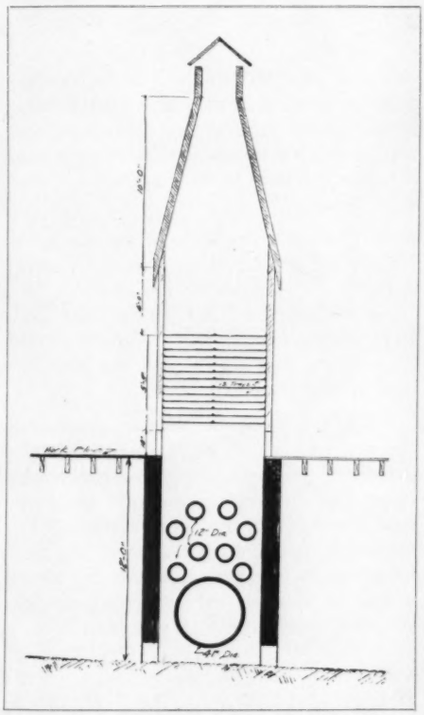


Fig. 2. Typical arrangement of tray stack type dryer.

Fig. 1 illustrates what can be done in the way of lowering fuel usage by increasing the efficiency of the evaporator. However, old man "Interest and Depreciation" steps into the picture at this point. For example, a dehydrator drying apples may operate at 20 per cent efficiency, drying 1,000 tons of green apples per season, which could be increased to 30 per cent by changing to a tunnel-type dryer with recirculation of air. The investment cost of this type of dryer would be approximately $5,000 more for the same capacity than the type generally used. The interest and depreciation on this amount, plus the increase in power costs, would far exceed the savings made in fuel by increasing the overall efficiency from 20 to 30 per cent.

The chart in Fig. 1 has been calculated for a 1,200 B.t.u. gas, which is approximately the heat value of the gas being served by the Pacific Gas and Electric Co. Gas used per ton of fruit dried can be determined for gas of other B.t.u. values with little difficulty. Practically all changes made by commercial dehydrators are based on the ton of green fruit, so the values given on the chart are based on green tons. However, the average of gas per ton of dry fruit can be readily determined by multiplying the green ton average by the number of tons of green fruit required to produce one ton of dry fruit.

From a gas company viewpoint of disposing of the largest volume of gas, it is interesting to note from the chart that the drying of apples represents the best business, with pears, apricots and peaches a close second. Raisins, too, are good volume producers. Prunes rank next, with walnuts the least attractive type of business insofar as volume is concerned. The above values have been borne out by the actual usage, as shown in Table No. 1.

Fruit dehydrators are of several general types—one, the tray stack type; two, the floor stack type; three, the tunnel type recirculating dryer. There are almost as many variations of these types as there are operators making use of them. Over a great many years individual operators have developed little tricks which they think are theirs peculiarly and which give a better product than would result if some other method were used. Of course, many of the operators of dryers do not have a very clear picture of what actually takes place in the drying operation, but have learned over a long time that certain conditions give good results.

For example, one operator of a dryer, who has been drying fruit for a period of 50 years, had no idea of what was meant by "relative humidity" nor that the relative humidity of the air could be determined by the reading of wet and dry bulb thermometers.

However, there are many dehydrator operators who have the best of equipment and operate their plants on a scientific basis.

Drying of apples is generally effected in stack type dryers, either of the floor or of the tray type. In the tray type dryer the apples are placed upon trays approximately 3 feet square, to a depth of 2 to 3 inches. The floor type dryers differ in that the apples are spread on the floor of the dryer to a depth of 8 or 12 inches and the heated air rises up through the mass. From time to time the apples on the floor are turned over so they do not cake and all surfaces of the apples are exposed to the drying air.

The heating arrangement in both of these dryers consists of a steel shell 3 or 4 feet in diameter and 10 or 12 feet long,

(Continued on Page 40)

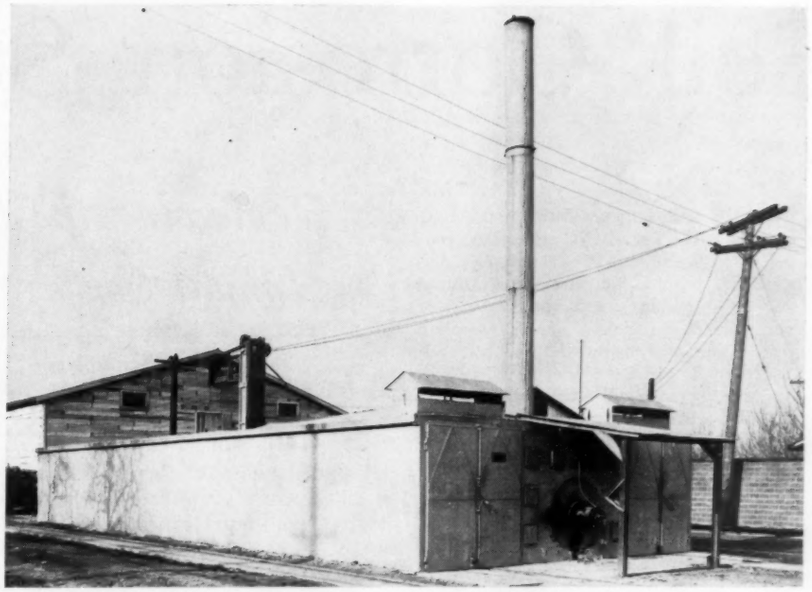


Fig. 3. Typical tunnel type dryer, with oil burner standby.

* Presented before the Pacific Coast Gas Association's Commercial Section Conference at Los Angeles, California, March 16-17, 1933.

Soil Corrosion Symposium

Reviewing the Bureau of Standards Annual Conference on Soil Corrosion

Abstracts of Individual Papers, Prepared by GUY CORFIELD
Chemist, Los Angeles Gas and Electric Corporation

NO ONE attending the Bureau of Standards Soil Corrosion Conferences, conducted in Washington, D. C. and Los Angeles, Calif. within the past month, could fail to be impressed with the amount of current research being done on soil corrosion subjects. The two companion conferences, which covered virtually the same subject matter, were sponsored by the Bureau's Underground Corrosion Section, of which K. H. Logan is chief. W. M. Henderson, superintendent of distribution for the Los Angeles Gas and Electric Corp., called the Los Angeles conference at Mr. Logan's request.

Nearly 50 individual papers were prepared for the conferences, a complete list of the subjects and authors being given on Page 19 of this issue.

To facilitate discussion of the lengthy list of subjects at the Los Angeles conference, the individual papers were briefed by Guy Corfield, chemist of the Los Angeles Gas and Electric Corp., and these briefs were presented prior to the discussion under each major topic division. Through the courtesy of Mr. Corfield *Western Gas* is enabled to publish a number of these briefs, beginning on this page. Several papers which were confidential in nature, and other papers which will be published in full in future issues, are not covered in the abstracts.

The Soil Corrosion Conferences have become an annual feature of the Bureau of Standards service, and each year add notably to corrosion literature.—*Editor.*

Seasonal Variation of Earth Resistivity Readings

By A. B. Allyne, Southern Counties Gas Co., Los Angeles, Calif.

A STUDY of a series of Shepard Rod readings by both "dry" and "wet" method, taken each month for a period of one year at 166 selected locations throughout the Southern Counties Gas Co. distribution system, to show the variations introduced by seasonal moisture changes.

Assumed that the best index to the corrosiveness of a soil (referred to in this paper as Corrosion Index) is the minimum resistivity reading obtained in that soil, and that any reading that does not exceed this minimum reading by more than 50 per cent is sufficiently accurate for practical purposes.

Discussion of Survey: "From the work done to date, it appears that both the climatic cycle and the spottiness of soils are liable to cause serious errors in a soil survey by the field method; however, these errors can be greatly minimized by a combination of change of procedure and an intelligent study of each survey as a particular problem in itself. While the effect of the climatic cycle can apparently be defeated by use of the wet test, none of the soil survey methods proposed to date can give 100 per cent accuracy on account of the spottiness of the soils. The writer has made Shepard tests in some ditches where almost any reading on either scale can be obtained in a few feet, while other ditches have given almost constant resistivities in numerous readings for several hundred feet. Our conclusion has been that the only way to detect these spotted soil areas, is to make Shepard Rod tests at no more than 50-foot intervals in the open ditch after excavation. This procedure involves but little additional expense over the original survey ahead of the betterment work, as hundreds of tests can be made in a relatively short time. This check-up is not economically feasible in a survey method requiring the sending of soil samples into the laboratory for test. In our work, this check-up has enabled the detection of a good many 'hot spots' that otherwise would have gone undetected."

Conclusions

"1. For Southern California soils, less than 30 per cent of the locations under observation showed a true Corrosion Index throughout the annual climatic cycle by the Shepard Rod method of test.

2. In general, light, loose-packed clays and loams vary in resistivity with the climatic cycle.

3. Sands and heavy, tight packed clays are more uniform in resistivity throughout the year.

4. Wet tests, in general, approximate the minimum dry test reading obtained for any given location at any time of the year.

5. A dry survey with the Shepard Rods in the winter season may be approximately 70 per cent correct in determining the true Corrosion Index.

6. A similar survey made in the summer months will not be more than 35 per cent accurate in determining this same Index.

7. A wet test method of soil survey ahead of trenching may be approximately 77 per cent correct in measuring the Corrosion Index and is independent of the time of year it was made.

8. These conclusions have been shown to apply to soils in the Southern California area and do not necessarily hold for other parts of the country."

In addition to the above, the soils were tested for moisture content at the peak of the dry season and the wet season, respectively.

"The results show that in most cases the moisture at 30 inches increased by a surprising amount soon after the winter rains. In only eight cases did the moisture decrease in the winter time. The variation in moisture disclosed for these locations is the logical result to be expected in view of the resistivity changes obtained from the one year test."

Chemical Corrosive Factors

By P. J. Richards, Richards Laboratory, Denver.

THIS study reports on 1842 analyses of soils from seven states or areas in the U. S.; analyses made in connection with corrosion surveys of pipe lines or pipe line routes; samples taken by soil auger.

About 20 physical and chemical determinations were made on each sample. Of the physical, moisture content and homogeneity were considered of paramount importance. Moisture interpreted in terms of time and amount of rain-

TABLE NO. 1

District	No. of Samples	Average of: Total Sulphur %	Parts per Million: Sulphate	Parts per Million: Chloride
West Texas	518	0.157	258	17
New Mexico	421	0.142	160	35
Miss.-Alabama-Georgia	295	0.10	54	12
Pennsylvania	54	0.08	10	10
Montana	187	0.106	261	27
Colorado	266	0.48	800	50
Mid-Continent	101	0.03	46	28
	1842			

AVERAGE OF 1842 SAMPLES

Total Sulphur %	Parts per Million: Sulphate	Parts per Million: Chloride
0.148	197	16.4

fall. Of chemical determinations, total sulphur (acid soluble sulphur) in the soils, and sulphates and chlorides in the water extract, were considered most important. "We find that severe corrosion and frequently relative corrosiveness can be explained by the varying amounts of these chemicals found in the soils." "Moisture factor is considered a controlling factor when these chemicals are present in quantity."

Table No. 1 is given as summary of tests.

"We have samples of soils from locations in Colorado where ¼-inch steel pipe was pitted through to such an extent as to destroy its serviceability in less than two years. Such locations invariably contain either pyrite or calcium and magnesium sulphate, and are generally small in area. The total sulphur in these soils often runs as high as 6 per cent. Our water extract from such locations frequently contains several thousand parts per million sulphates in terms of SO_4.

Corrosion of Steel Lines in Iraq

By F. L. Bassett, Baghdad, Iraq.

CONSIDERABLE corrosion has been experienced on steel lines in Iraq. The soil is "alluvium consisting mainly of silty marl, with patches of gypsiferous sand and gravel." The lines are close to the surface, flooded at times by river water. After the floods disappear "salt" is visible in patches on the surface. Pipe was in one instance perforated and unusable in 18 months (wall thickness of pipe not given).

As a result of this, a laboratory examination was made by immersing two kinds of pipe line steel in 80 soil samples, involving a total of 480 specimens. The conclusions are quoted herewith:

"(1) Oxygen supply to cathodic points is the main factor controlling erosion of anodic areas.

(2) Under suitable moisture conditions, therefore, corrosion is active in these open textured soils free from chloride.

(3) The attack is stimulated by chloride ion in small proportion (e.g., below 0.2 per cent in the present series of tests).

(4) Greater proportions of chloride, however, tend to reduce the intensity of attack by raising the hygroscopic character of the soil and thereby hindering the penetration of oxygen from the surface. The effect becomes appreciable with a soil chloride content above 0.2 per cent (NaCl), and is well marked above the 1 per cent limit. With highly salted clays the rate of attack is very much reduced."

Chlorides in Corrosion

By U. R. Evans, Cambridge, England

A RECENT published report by Bassett, based on a study of corrosiveness of a large series of soils collected in Iraq and Syria, occasioned some surprise by showing that the soils with high chloride content were, as a class, less corrosive than those of low salinity. Mr. Evans was asked to discuss this matter and consented to do so on the condition that, as he had had very little practical experience along this particular line, his discussion must be considered as academic and theoretical only.

The presence of chlorides in soil may to some extent retard corrosion, because they attract water, which keeps the soil moist and therefore prevents cracking and loosening and introduction of oxygen; also chlorides in water reduce the solubility of oxygen in the water and therefore may retard corrosion somewhat unexpectedly.

On the other hand, conditions may arise where a certain concentration of chlorides will produce severe corrosion in limited areas (phenomena of pitting); also the presence of chlorides makes the pipe very susceptible to anodic corrosion (electrolysis or long line currents).

Mr. Evans concludes as follows: "Whilst, as shown by Bassett, there can exist chloride-rich soils which are by no means abnormally corrosive, owing to their high water retention and the resultant absence of shrinkage cracks through which oxygen may pass down, yet it is possible to picture cases where the well-known power of chlorides to dispel passivity may be all-important, and the oxygen excluding properties will not avail against this. Any soil known to be highly saline must be held suspect until it has been proved to belong to the first class. In general, for a soil of a given class, under fixed conditions, there will be a range of chloride-contents which may be expected to be more dangerous than higher or lower values. Further experimental work on synthetic soils, comprising a range of chloride contents and a range of hydrogen ion concentration values, would seem to be called for."

Corrosion of Parallel Pipe Lines Crossing a Salt Water Channel

By F. D. Posey, Pipe Line Engineer, General Petroleum Corp. of Calif., Los Angeles, Calif.

Subject: Life history and inspection of six oil lines crossing under Wilmington (Calif.) Channel, from Mormon Island to Terminal Island.

Distance: Distance (level) across bottom of channel, at depth of 40 feet below low tide, is 750 feet; distance (sloping) from bottom of channel to low water, is 80 feet on each side.

Protection: Two coats of inhibitive grease with two wraps of impregnated fabric, with final wrap of 24 oz. canvas treated with bituminous paint.

Installation: Pulled across with winch. Protection probably damaged by one line scraping on other or on metallic or other hard objects on bottom of channel.

Insulating Flanges: Installed on both banks, on each line, to prevent current going from shore lines into channel.

Composition of Lines: 0.08 to 0.10 per cent carbon steel.

Length of Service: Laid December, 1927; first leak on line No. 1, October 1931, on sloping portion; next leak on line No. 3, August, 1932, also on sloping portion. Lines removed on and after this latter date.

Corrosion Observations: The only complete penetrations occurred on sloping portions—in other words, corrosion was more severe on sloping portion than on bottom level portion. Suggested explanation of this:

(a) different concentration of oxygen and chloride between bottom and top of channel,

(b) sloping portions exposed to water movement so that corrosion products could be carried away; bottom level positions covered with mud which retained corrosion products in place.

Note: Accessible portions—between low water and dry land—not dealt with.

On bottom, all pipes pitted to about same extent and to maximum depth of 160 mm., except No. 5, which was pitted to 200 mm. No. 5 protection was in best shape—thought that with better coating on No. 5 the pitting was more concentrated.

Future Plans: Other coated lines in the vicinity have similarly failed, whereas some uncoated lines, notably a wrought iron galvanized gas line, have stood up well. From these observations new installations made as follows: all six lines of 0.30 per cent to 0.40 per cent carbon steel; No. 1 galvanized; No. 2 bearing 0.2 per cent to 0.25 per cent copper, and galvanized; other four not galvanized; no protection; all Victualic couplings with ends upset instead of grooved.

Field Experiences with Ferrous Pipe Materials

By R. C. Terradel, Los Angeles Gas and Electric Corp.

Copper Bearing vs. Galvanized Steel.
Copper Bearing vs. Plain Steel.
Plain Bearing vs. Galvanized Steel.
Cast Iron Bearing vs. Plain Steel.

No evidence to show that one ferrous pipe material is more corrosive-resistant than any other, soil action being a function of the corrosiveness of the soil and not the resistance of the metal.

Soil Moisture Survey... Procedure and Results

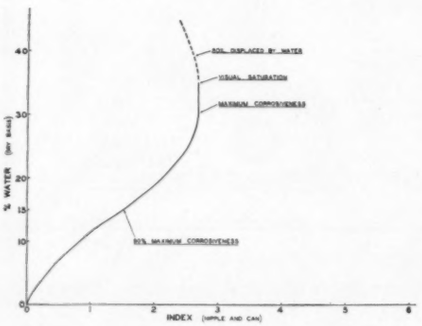
By Guy Corfield, Los Angeles Gas and Electric Corp.

FIFTY-FIVE typical locations, 10 under pavement were sampled each month for almost three years.

With Respect to Water in Soil:

1. Point of maximum corrosiveness is most significant; should be used as basis for all calculations; is different for each soil or soil type; can only be determined experimentally.

2. Actual per cent moisture has no significance, except to show variation, until converted into per cent maximum corrosiveness.



Effect of water on soil corrosiveness—typical soil.

3. Soil, when mixed with water to point of visual saturation, will always exhibit maximum corrosiveness.

4. Corrosion is proportional to water content, up to point of maximum corrosiveness.

General Conclusions for Los Angeles Area:

1. Under pavement soils as a class are more wet than those not under pavement.

2. A relatively large increase in rainfall produces a relatively slight increase in soil moisture.

3. In terms of average per cent maximum corrosiveness, all soils and locations are surprisingly uniform; the average condition for any seasonal cycle is one of less than 50 per cent of maximum corrosiveness.

4. For all practical purposes, the moisture factor may be considered a constant, and disregarded when making a soil survey by the nipple-and-can method.

Graveyard Tests for Pipe Coating Materials

By O. L. Wrestler, Los Angeles Gas and Electric Corp.

Series of test holes, artifically reinforced with sodium chloride, sulphate and carbonate, and maintained at uniform salt concentration, and moisture.

All pipe protective materials applied to 2- x 24-inch pipe nipples and buried in these holes for 100-day periods until failure.

Resistance measurements taken, initially and at end of each period. Failure considered to be when coating comes off in spots, or rust appears through the coating.

Diagram shown of small applicator, whereby any combination of bitumen and wrapper can be applied to a 2- x 24-inch nipple, using only one gallon volume of bitumen.

Nipple and Can Methods... Application of Results

By Guy Corfield, Los Angeles Gas and Electric Corp.

Summary of paper entitled "Soil Survey Results and Their Practical Application—Nipple-and-Can Method."

9500 Samples Taken in 200-Square-Mile Area

Index Limits	*Soil Corrosivity*	*Protection*	*Approx. % of total Area*
0.00 to 0.99	Slight	*None	38
1.00 to 3.99	Moderate	Yard Wrap	48
4.00 and over	Severe	Special	14

* Except 2-inch and under.

Soil Stress on Various Soils and Coatings

By O. L. Wrestler, Los Angeles Gas and Electric Corp.

Mud Pat Test: Wet pat of soil applied to bitumen on steel plate, allowed to dry, washed off; distortion denotes:

(a) Stress exerted by soil if using standard bitumen;

(b) Susceptibility of bitumen if using standard soil.

Soil Box Test: Pipe nipple coated with bitumen put in box filled with wet soil. Soil allowed to dry. Nipple removed, washed and examined, and interpreted as in (a) and (b), above.

Cathodic Protection Tests Using Various Voltages

By Guy Corfield, Los Angeles Gas and Electric Corp.

Conclusions:

1. Complete cathodic protection can be afforded bare pipe, in severely corrosive soil, if the pipe is maintained at 0.10 volts below earth.

2. An unnecessarily high "protection" voltage is not desirable because it tends to break down the coating and increase current flow, which is an additional expense, and in turn augments deposition of salts which may, themselves, deteriorate the coating.

Water Absorption Test for Bituminous Coatings

By Guy Corfield, Los Angeles Gas and Electric Corp.

Weighed brass cup ¼-inch deep filled with bitumen; weighed, immersed in distilled water; periodically removed, dried and weighed; increase in weight considered to be absorbed water; results calculated to "grams of water absorbed per square foot of exposed surface vs. time in days."

Hard (high melting point) compounds absorb less than soft ones.

Coal tar base compounds absorb less than asphalt base.

Cement for Underground Pipe Line Protection

By J. H. Peper, Northern Pipe Line Co., New York, N. Y.

THE value of cement as a protective coating for metals subjected to the corrosive action of soils can hardly be questioned . . . at the present time one can, through control of mixture, materials, water ratio, time of setting and methods of application, produce a mixture that will fit any condition of soil corrosion likely to be met in pipe line work."

"The protective value of cement in cases of electrolysis due to stray currents is questionable. Boxing and cementing lines to protect them against stray currents was tried by our companies many years ago and proved a failure. The pipe was destroyed in a short time."

The author then explains that his companies by the use of electrolysis surveys and insulating flanges, isolate the sections where current discharge occurs, coat them with bitumens, and coat everything else with cement or concrete.

Follows a listing and description of cement and concrete jobs that have come to the author's attention.

"At the present time, our companies are using a method involving a form which applies a 1:3 cement mortar ½- to ⅝-inch thick." (The greater portion of the paper consists of description of this method of form application, in great detail).

Following advantages of using cement are listed:

1. No time lost in waiting for proper weather conditions.
2. Reconditioning can be done without taking line out of service.
3. Not necessary to clean line thoroughly.
4. Cement has high corrosion inhibitive qualities and arrests corrosive action.
5. Less danger of injury to men when using cement than when using hot bitumens.
6. Will not be affected by oil soaked soil.

Following application methods listed:

1. Permanent or semi-pemanent forms.
2. Cement gun.
3. Removable forms for applying thin coating.
4. Machine wrapping.
5. Combination of cement, or sand and cement, with asphalt emulsions.

Corrosion of Pipe Lines and Cathodic Protection

By R. J. KUHN, *New Orleans Public Service Inc., New Orleans, La.*

THIS paper covers a wide scope, dealing in considerable detail with both theoretical and practical aspects of the subject.

Under the head of Types of Corrosion the author classifies corrosive processes and methods of protection, and treats of corrosion due to stray current electrolysis, long line galvanic currents, local galvanic currents, galvanic currents generated on adjacent structures, and direct chemical action.

"Methods of Protection Employed on the Welded Steel High Pressure Gas System in New Orleans" is the title of another major division in the discussion, under which are covered these subjects: Electrical Drainage, etc. for Electrolysis; Removing Contacts and Insulating Steel Gas Lines from Other Structures, Long Line Currents; Cathodic Protection for Local Galvanic, Foreign Galvanic, Direct Chemical Action and Traces of Electrolysis and Long Line Currents; Importance of Coating Resistance.

A study of performance of coating resistance, made without disturbing the lines, is also reported in the paper.

Under "Possibilities for Using Cathodic Protection", Mr. Kuhn works out a typical case, and concludes as follows:

"Seventy-two cents a month power costs to cathodically drain 9 miles of pipe line having an average coating resistance of 50,000 ohms per square foot. It is probable a rectifier for such a purpose could be purchased for about $20, or made at home for less. In addition to low initial cost and operating expense, maintenance is also a very small item.

"Assuming the theory of cathodic protection correct, it appears that there are vast possibilities for its application in various industries operating underground metallic structures."

Mr. Kuhn's paper incorporates a considerable number of pertinent curves and figures.

Oxidizing Agents as Accelerators of Corrosion

By S. U. McGary, United Gas System, Houston, Texas

SOIL resistance determined at saturation, coupled with an estimate of the yearly moisture content, is a barometer by which the corrosiveness of any soil may be roughly defined. However, a more complete study of the salts in the soil will often reveal why two spots of the same soil resistance and moisture content will corrode pipe at different rates."

"Salts usually contained in a soil consist of chlorides and sulphates of sodium, magnesium and calcium. In the area around San Antonio, Texas, nitrates have also been found in hot spots and have undoubtedly accelerated the rate of corrosion in that area."

"It is easy to account for the rapid acceleration of corrosion in spots containing an appreciable amount of oxidizing chemicals, such as nitrates in the soil, when we examine the theoretical action of such chemicals in the presence of moisture on steel."

" . . . a high content of nitrates in a gumbo soil does not seem to be as serious as the same amount in a porous sandy soil. This is undoubtedly due to the fact that these oxidizing chemicals such as nitrates cannot be as readily moved about in a gumbo soil as in a loose porous sand."

"Since oxidizing chemicals such as nitrates are in themselves destroyed by reaction with steel, it is probable that the rate of corrosion from this source will be somewhat reduced after a short time of burial."

"The corrosion products found in nitrate-containing soils are a solid, dense, tightly adhering scale, with deep pits under the scale."

Cathodic Protection of Pipe Lines

By Starr Thayer, United Gas System, Houston, Texas

PRELIMINARY experiments to determine the potential necessary to afford cathodic protection, were made by preparing a container filled with a white clay saturated with a saline solution of potassium ferrocyanide, imbedding in this clay a cleaned test nipple, and making the nipple negative to the clay at various voltages. The voltage at which no blue color was formed at the

juncture of the pipe and clay (indicating no iron removed from the nipple) was taken as the voltage necessary for cathodic protection. This voltage was found to be approximately 0.9 volts, as measured by a McCollum earth current meter to a copper sulphate electrode.

Field installation made on a 4-mile section of 6-inch enamel coated (assume bituminous enamel) line, passing through several different soil structures. Insulated joints at each end of section. Electric energy obtained from A.C. power line through copper oxide rectifiers. Ground connection consisted of 20 foot length of 4 inch pipe set vertically in earth (50 lbs. of salt poured down hole). Electric energy consumption was 2 amperes at 4.1 volts D.C. End of line farthest from ground connection was 0.88 volts negative to earth in terms of copper sulphate electrode test. At this end tests were made by polishing area of pipe and laying against it a small bag of white clay saturated with water and potassium ferrocyanide; backfilling hole; removing bag after 48 hours. Bag and clay came off white, indicating no loss of iron from polished pipe surface. Similar test made on isolated nipple gave decided blue color to clay.

Other similar installations have been made and cathodic protection considered a success and to be feasible, except in the case of bare or poorly protected lines, where cost may be prohibitive. Following costs are submitted, based on power at 2½c per Kw. hr.

Cost of Protecting

	Per Mile Per Year
A 6-inch line, coal tar enameled	$3.00
An 18-inch line, coal tar enameled	15.60
A 9-inch line, hot asphalt coated	88.00
A 14-inch line, greased	490.00

Note: The greased line was not fully protected.

At present every pipe line built by this company is so designed that this system can be advantageously applied—principally by selecting a coating of high electrical resistance and applying it as carefully as possible.

Chemical Relationships of Soil Series and Soil Groups

By Horace G. Byers

THE writer has been requested to show to the conference the connection which exists between the classification system which has been developed by the soil survey and the chemical composition of the soils; the inference to be drawn being that if there is such a connection, then the study of soil corrosion being essentially a chemical study should be carried on in the light of this relation. He has chosen to attempt this this task by means of a table showing the classification system as at present used and by 29 tables, which are appended, showing (1) the degree of chemical uniformity of the soil series; (2) the degree of chemical uniformity within a soil group and (3) the wide divergence between different soil groups and series."

"While it is recognized that we have not a sufficiently large number of types of each group to closely define the chemical characteristics of each great group, yet we believe that the data assembled demonstrate the following facts: First, each great soil group, as identified by the soil survey, has its own field characteristics and that these are the reflection of its chemical character. Second, the chemical composition which is common to each group may be confidently expected to manifest itself in common behavior, within limits, in all respects, including the effects which are involved in corrosion. Third, the behavior of a soil type within a group will vary from the mean behavior to the degree to which its weathering varies from the mean.

"The final conclusion seems warranted that the most hopeful method of throwing light upon the causes and the means of control of corrosion in soils is a systematic examination of the relation between soil types and groups and the processes of corrosion."

Measurement of Flowabitity as Related to Application of Hot Bituminous Coatings

By F. W. Yeager, Barrett Co., Edgewater, N. J.

AN APPARATUS is described by which the relation between application temperature, pipe temperature and coat thickness can be determined for hot applied bituminous coatings. The results correspond to practical field application.

The term Flowability is defined as the application temperature required to produce a coat of standard 2/32-inch thickness at a normal pipe temperature of 77°F. Tests of several commercial coatings show widely different flowability figures which are correlated with their compositions."

The apparatus consists essentially of a heating vessel, and a section of 10-inch pipe that can be internally heated or cooled to any desired temperature. Thus unusual pipe temperatures can be produced and coating temperature varied to obtain constant thickness. The pipe is oiled so that the coating can be stripped off and measured.

It has been observed that " . . . the thickness of coat obtained is affected to a marked degree by the temperature at which the coating is applied and to minor degree by the temperature of the pipe."

Locating Pipe Line Inspection Points

By Stanley Gill, Consulting Engineer, Houston, Texas

THE steps which are involved in the determination of the condition of a buried pipe line, by inspection, may be divided as follows:

(a) Data upon line;
(b) Service record of line;
(c) Location of points at which inspections are to be made.
(d) Inspection of pipe;
(e) Inspection of protective coatings;
(f) Analysis of data;
(g) Interpretation of results.

"In the following sections of this paper these items are discussed in detail."

"With a full appreciation of the fact that the data are inadequate for final conclusions, and in the hope that additional information from which more positive conclusions can be drawn may be made available in future, the following tentative requisites for location of inspection points may be laid down:

(a) Inspection of a pipe line should always be made at points separated from one another by a uniform distance.

(b) These inspection points should be located strictly at pre-determined intervals, without regard to corrosion experience or conditions of topography or soil.

(c) This is the only method of inspection which can possibly give an accurate statistical record of the condition of the pipe in the line.

(d) The degree of precision of the results obtained from an inspection at such equally spaced inspection points is determined by the closeness with which they are spaced.

(e) For economy in inspection, the greatest space which is compatible with the desired accuracy should, of course, be used.

(f) For determination of average depreciation of a line, an interval of 2000 feet will give results of a workable degree of precision. Inspections at greater intervals will lead to misleading results.

(g) Where the inspection is intended to serve as the basis for a repair or reconditioning program, a somewhat closer interval should be used, and a minimum spacing of 1000 feet between inspection points is recommended.

(h) Conclusions (a) to (e), inclusive, are not tentative, but are based upon positive, definite and unalterable facts; the numbers given in conclusions (f) and (g) are tentative, and will be subject to slight modification as additional thorough data may become available."

Test data are analyzed and tabulated to show Number of Feet of Pipe Recommended for Reconditioning vs. Actual Number of Feet of Pipe Reconditioned and Condition of Pipe After Uncovering. There are many variables entering into the recommendations, analysis and employment of these test data, such as opinion of test engineers, and operating policy of pipe line company. The writer apparently believes, however, that such a survey is of substantial assistance and economy to pipe line reconditioning. His conclusions are quoted:

"A loss in current, as brought out by these tables, although indicative of active corrosion, does not indicate the actual condition of the pipe. A loss in current of a few points may mean that the pipe is badly pitted, or it may mean that corrosion has just begun. Whichever the case, such corrosive action should be stopped, if pitted badly, to prevent a leak in the near future; if recently developed corrosion, to stop this action before serious pitting can develop.

"While these new methods of determining bad pipe and corrosive soil areas by measuring currents and soil resistivity, are not perfect, it must be kept in mind that, compared with the old methods, much progress has been made."

Comparison of Corrosion Survey Recommendations to Pipe Line Corrosion

By J. Campbell Stirling, Stanolind Pipe Line Co., Tulsa, Oklahoma

"DATA accumulated from corrosion surveys, on 650 miles of buried pipe lines, tend to verify the findings of previous investigations that there is a definite correlation of pipe line currents and soil resistivity to pipe line corrosion."

Pipes were located by radio pipe line finder. Long line currents were measured by observing the potential drop of a 25-foot length of pipe, contact being made by prodding down to the pipe and through the insulation by means of sounding rods made of tool steel with drill bits on ends. Measurements taken every 400 feet, except where there were creek crossings and other obvious corrosive locations, or where points of current loss were indicated; at these exception locations enough tests were made to determine exact point of maximum current discharge off pipe.

Often fluctuating stray currents were observed, superimposed on the more steady long line currents.

Resistance of soil taken by Shepard Rods. "Although this apparatus (Shepard Rod) gives only comparable resistivities they are sufficiently accurate for all practical purposes, provided the soil is not too dry. Measurements made in dry soil mean little, even though an indication on the meter is obtained. It is, therefore, necessary to confine resistivity measurements to damp or wet soil."

The cost of the survey averaged $15 per mile, for the total of 650 miles, covering salaries of 4 men, materials, automobile expense and overhead. Four men averaged 2½ miles per day.

Soil Corrosion Conference Papers

FOLLOWING is a complete list of the papers prepared for the Bureau of Standards soil corrosion conferences, held at Washington, D. C. (March 30, 31, April 1) and Los Angeles, Calif. (April 13, 14).

Abstracts of many of these valuable studies are published in this issue of *Western Gas*, beginning on Page 14. Those wishing further information in regard to any of the papers may communicate directly with the authors or with K. H. Logan, chief of the Underground Corrosion Section, Bureau of Standards, Washington. D. C.

BUREAU OF STANDARDS
THIRD SOIL CORROSION CONFERENCE
INDEX OF PAPERS

Investigation of Vitreous Enamels—O. E. Andrus and W. G. Martin, A. O. Smith Corp., Milwaukee, Wis.

Corrosion of a System of Parallel Pipe Lines Crossing a Salt Water Channel—F. D. Posey, General Petroleum Corp. of Calif., Los Angeles, Calif.

Portland Cement Pipe Coatings—F. N. Speller, National Tube Co., Pittsburgh, Pa.

Seasonal Variation of Earth Resistivity Readings—A. B. Allyne, Southern Counties Gas Co., Los Angeles, Calif.

Chemical Corrosive Factors—P. J. Richards, Richards Laboratory, Denver, Colo.

Testing the Resistance of Steel to Soil Corrosion—G. N. Schramm, American Sheet & Tin Plate Co., Pittsburgh, Pa.

Electrolytic Failures of Coated Steel Lines: A Discussion of Their Causes and Prevention—East Ohio Gas Co., Cleveland, Ohio.

Chlorides in Corrosion—U. R. Evans, Cambridge, England.

Detection of Flaws in Pipe Line Protective Coatings Before Burial—G. W. Clarvoe. Johns-Manville Corp., New York, N. Y.

Soil Corrosion Investigations and Procedures in Los Angeles—Guy Corfield, O. L. Wrestler, R. C. Terradell, Los Angeles Gas and Electric Corp.

Cathodic Protection of Pipe Lines Against Soil Corrosion—Starr Thayer, United Gas System, Houston, Texas.

Identifying Tests for Bituminous Pipe Coatings and Their Possible Connection with Protective Quality—H. S. Christopher, Bureau of Standards, Washington, D. C.

Corrosion Studies of the Gas Distribution System in the District of Columbia—Thomas R. Tate.

Soil Descriptions to Accompany Map of the United States for Use in the Study of Soil Corrosion—V. A. Grodsky, Cast Iron Pipe Research Association, Chicago, Ill.

Soil Acidity as a Factor in the Corrosion of Ferrous Metals—I. A. Denison, Bureau of Standards, Washington, D. C.

A Method for Determining the Economic Value of Corrosion Surveys—Scott Ewing, A.G.A. Research Associate, Bureau of Standards, Washington, D. C.

Oxidizing Agents as Accelerators of Pipe Line Corrosion—S. U. McGary, United Gas System, Houston, Texas.

The Use of Cement in Protecting Underground Pipe Lines—J. H. Peper.

The Chemical Relationships of Soil Series and Soil Groups—Horace G. Byers.

Theory of Soil Corrosion—Walter F. Rogers. Chemical Department, Gulf Oil Companies, Houston, Texas.

The Reduction of Corrosion in Water Pipe—E. S. Hopkins, Bureau of Water Supply, Baltimore, Md.

A Suggested Procedure for Determining the Protective Needs of Pipe Lines Against Soil Corrosion — Underground Corrosion Section, Bureau of Standards, Washington, D. C.

Cathodic Protection of Pipe Lines—W. R. Schneider, Bureau of Tests and Inspections, Pacific Gas and Electric Co., San Francisco. Calif.

The Corrosion of Lead and Certain Lead Alloys by Soils—R. M. Burns and C. L. Hippensteel, Bell Telephone Laboratories.

Communication on Soil Corrosion—F. L. Bassett, Chemical Laboratory, Baghdad, Iraq.

Pit Depths as a Measure of Corrosion—Gordon N. Scott, A.P.I. Research Associate, Bureau of Standards, Washington, D. C.

Corrosion of Underground Pipe Lines and Cathodic Protection—R. J. Kuhn, New Orleans Public Service Inc., New Orleans, La.

Experiences with "Holiday" Detectors—Linden Stuart and W. H. T. Thornhill, Wailes Dove-Hermiston Co., N. Y.

(Continued on Page 28)

NEW NATURAL GAS SERVICE AREA

1932-1933

FOR the fourth successive year *Western Gas* presents a survey of communities newly served with gas, and those into which natural gas has been introduced in place of manufactured gas. The towns and cities listed below have received gas, or changed over to natural gas, since January 1, 1932.

On the basis of line construction planned for the coming months and franchises granted throughout natural gas service area, it is predicted that several events of major importance will transpire in the 1933-1934 period. One of the most important of these should be the addition of Wisconsin with its manufacturing load as a natural gas consuming state, through major line completions of the Natural Gas Pipeline Co. of America.

Western Gas extends its appreciation to companies named in the following survey for supplying the data presented.

Service Begun Since January, 1, 1932

Company / Town	Population	Town	Population
CALIFORNIA			
Coast Counties Gas and Electric Co.			
Nichols			396
Pacific Gas and Electric Co.			
Fowler			1,171
San Joaquin Light and Power Corp.			
Chowchilla			847
Southern California Gas Co.			
Orosi		Sultana	165
Cutler	510		
COLORADO			
Arkansas Valley Natural Gas Co.			
Sugar City	598	Manzanola	578
Ordway	1,139	Fowler	968
Rocky Mountain Gas Co.			
Craig			1,418
ILLINOIS			
Central Illinois Natural Gas Co.			
Alexander			1,047
Illinois Northern Utilities Co.*			
Oregon	2,376	Mt. Morris	1,902
Polo	1,871		
INDIANA			
Indiana Gas Distributing Corp.			
Dana			859
IOWA			
Iowa Gas Distributing Co.			
Forest City			2,016
Northern Gas and Pipe Line Co.			
Clarion	2,578	Jefferson	3,431
KANSAS			
Kansas Power and Light Co.			
Beverly	328	Miltonvale	814
Bushton	325	Onaga	930
Claflin	607	Oskaloosa	733
Englewood	477	Ozawkie	100
Grantville	219	Perry	418
Holyrood	432	Tescott	382
Lecompton	288	Valley Falls	1,238
Lorraine	177	Vining	198
Macksville	868		
Kansas Pipe Line and Gas Co.			
Lorraine			177
Glen W. Leighty			
Cedar Vale			
KENTUCKY			
Peoples Gas Co. of Kentucky			
Somerset			5,506
Carrollton Gas Co.			
Carrollton			2,409
Kentucky Public Service Co., Inc.			
Hodgenville			1,104
Burkesville Gas Co.			
Burkesville			886
LOUISIANA			
Norco Gas and Fuel Co.			
Norco		Goodhope	
Logansport Gas Co.			
Logansport			1,400
MINNESOTA			
Hutchinson Gas Co.			
Hutchinson*			3,406
Minnesota Northern Natural Gas Co.			
Byron	323	Kasson	1,019
Mantorville	387	Dodge Center	854
Claremont	373	Wells	1,795
New Richland	777		
Two Harbors Municipal Gas Dept.			
Two Harbors†			4,425
MISSISSIPPI			
Southern Gas Utilities, Inc.			
Clinton			912
MISSOURI			
Missouri Power and Light Co.			
Vandalia	2,450	Martinsburg	530
Wellsville	1,525		
Central States Gas Utilities Co.			
Palmyra			2,000
NEBRASKA			
Peoples Natural Gas Co.			
Schuyler			2,588
Natural Gas Distributing Co.			
Red Cloud			1,519
OKLAHOMA			
Beggs Gas Service Co.			
Beggs			1,531
Collins Petroleum Corp.			
Kingston			552
Stratford Gas Co.			
Stratford			950
TENNESSEE			
Chattanooga Gas Co.			
Fayetteville			3,882
TEXAS			
Houston Oil Co.			
Dickinson			
Moran Gas Corp. of the South			
Conroe			10,000
Atchisonville			
Texas Cities Gas Co.			
Fort Crockett			
United Gas Public Service Co.			
Universal City			150
WASHINGTON			
Northwestern Natural Gas Co.			
Toppenish	2,774	Granger	569
Zillah	728		

* Manufactured gas service.

* Undiluted propane.

† Butane-air.

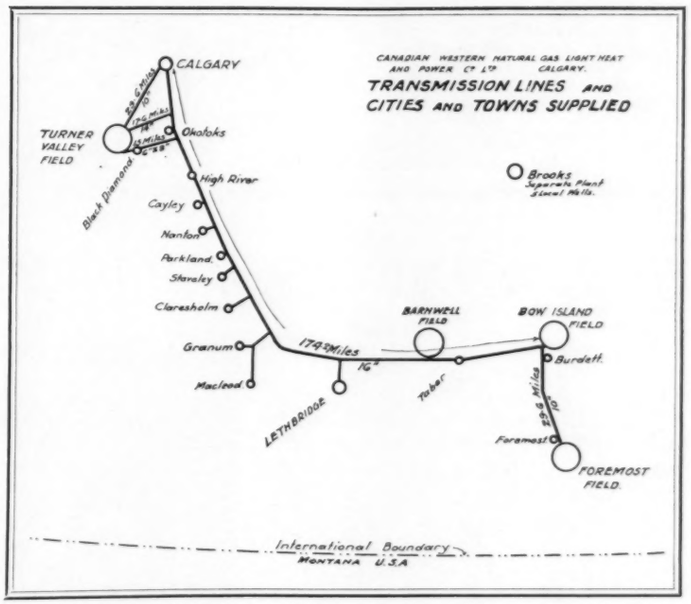
Change-Overs Since January, 1, 1932

Company / Town	Population	Meters
CALIFORNIA		
San Diego Consolidated Gas and Electric Co.		
San Diego	157,897	
Cardiff, Encinitas, Carlsbad	3,750	
Chula Vista	5,100	
Coronado	5,200	
Del Mar	200	
El Cajon	2,500	
Grossmont	250	56,939
Kensington Park	2,935	
La Mesa and vicinity	3,000	
Lemon Grove	1,350	
National City and vic.	8,500	
Oceanside	4,200	
Otay	500	
San Ysidro	1,600	
Solano Beach	550	
ILLINOIS		
Illinois Power Co.		
Springfield	71,864	16,214
Central Illinois Public Service Co.		
Mattoon	14,631	2,418
Charleston	8,012	1,057
Paris	8,781	1,416
Shelbyville	3,491	515
Taylorville	7,316	1,502

(Continued on Page 38)

Storage *of* Natural Gas

In the Bow Island Field, Alberta, Canada



By P. D. MELLON

General Superintendent and Chief Engineer, The Canadian Western Natural Gas, Light, Heat & Power Co., Ltd., Calgary, Alberta, Canada

ON August 3, 1930, The Canadian Western Natural Gas, Light, Heat & Power Co. of Calgary commenced the recharging and storage of natural gas in the Bow Island field located in Southern Alberta, approximately 170 miles south and east of the City of Calgary.

Prior to this date experiments were carried out to determine the feasibility of the scheme, and for this purpose gas was transported under natural pressure from a nearby field, a distance of 30 miles. The tests having proven successful it was decided to proceed with the major project of conveying waste gas from the Turner Valley field, a distance of 150 miles, compressing and storing it in the depleted Bow Island field.

Bow Island Field: The Bow Island gas field, which is located in Townships 10 and 11, Ranges 11 and 12, West of the 4th Meridian, covers an area of 30 square miles. It was originally discovered in 1909, and over a period of 10 years 27 wells were drilled to the gas horizon in the lower Colorado shales at an average depth from the surface of from 1,800 to 2,000 feet. The boundaries of the field were ultimately outlined on all sides by the drilling of either dry wells or those containing water. The average rock pressure originally encountered was 745 pounds, and in 1927, after withdrawal of approximately 38 billion cubic feet the pressure stood at 256 pounds.

Turner Valley Field: The Turner Valley field lies along the foothills of the Rocky Mountains and is approximately 45 miles distant by motor road from the City of Calgary. It is 14 miles in length, varying from ½ to 1 mile in width. Production is obtained in the upper part of the lime, the average drilling depth of wells being 5,000 feet.

The first large well of importance in this field to produce natural gas in quantity was No. 4 Royalite, drilled by the Royalite Oil Company in 1924. Since that time approximately 90 wells have been completed, with a total open flow of more than 600 million cubic feet daily.

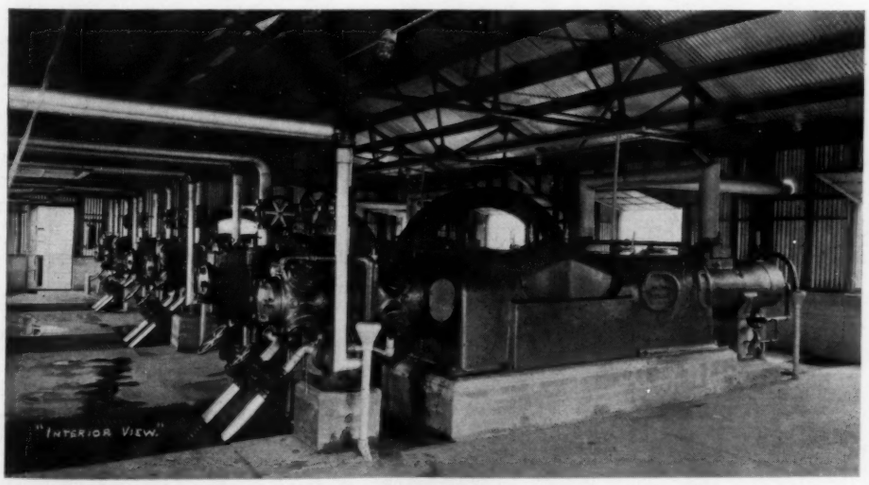
It was estimated that the original rock pressure of Turney Valley was approximately 2,500 pounds. The pressure in 1930 was estimated at 1,500 pounds and 1932 at 1,220 pounds. Practically all of the wells drilled produced wet gas, and after the extraction of naphtha the stripped gas is allowed to escape to the atmosphere. It is anticipated that conservation restriction recently introduced by the Provincial Government will materially prolong the life of the field.

Preparing Bow Island Wells and Field Lines for Repressuring: Although a total of 27 wells were originally drilled in the Bow Island field it was realized that possibly not more than 10 of these would be suitable for repressuring purposes.

It was necessary therefore to examine every well in the field thoroughly, a portable machine being used for the purpose. Ultimately all but nine wells were permanently abandoned by cementing off all strings, while the wells to be used for repressuring were either tubed or repaired to eliminate any migration of gas or water from one sand to another.

The exterior of each well used for repressuring was equipped with new fit-

(Continued on Page 26)



Interior of compressor plant built for Bow Island gas storage operations. Plant consists of three 2-stage, 200 H.P. direct-driven gas engine compressors.

Pacific Coast Gas Association

Managing Director: Clifford Johnstone
Association Headquarters:
447 Sutter Street, San Francisco

President: H. L. Masser
Vice-President and Executive Engineer,
Los Angeles Gas and Electric Corp.

Business Development Will Be Theme of Seattle Conference

SECTION and Committee Chairmen are giving a great deal of thought to the preparation of a program for the Northwest Conference which will provide the information and inspiration so much needed by all of us in these uncertain days. Business development is the big problem right now and the program will be principally devoted to sales, merchandising, dealer cooperation and competition. Set papers will be held to a minimum, most of the time being reserved for open discussion.

The Production Committee of the Technical Section under the leadership of C. P. Johnson of Bellingham will make its final annual report at the Conference. This technical program will include a description of Vancouver's new coal gas plant, a report on the latest developments in natural gas prospecting in Washington, and committee reports on gas holder maintenance, gas chemistry, and tar disposal. Also R. A. Hoffman of Spokane is collecting a number of interesting solutions of common operating problems which he will throw into the hopper for discussion.

Preparations Being Made for Convention Contests

THE Public Relations Section this year will conduct but two contests instead of the usual three, according to D. L. Scott, general chairman of the Section. These will be the speaking contests (one each for men and women) and the Women's Committee Exhibit.

The theme of the speaking contest, which is the same for both men and women, is "The Public Utility's Relation to Social Progress." The customary prizes are offered again this year; that is, a $50 first, and a $25 second prize, in each contest. W. A. Worthington of Pacific Gas and Electric Co., is the contest director. He has made quite careful preparations for the conduct of this contest, and has had a great deal of experience in public speaking and speaking contests. Director Worthington has some new ideas to introduce, which will, it is believed, tend to elevate the character of these speeches from that of memorized productions to more or less extemporaneously delivered discussions.

The same prizes in the Women's Committee Exhibit are offered again this year, that is, $25 for first prize and $15 for second prize. Mrs. Jeanette I. Rees, Southern California Edison Co., chairman of the Women's Committee, has charge of this contest, and has disseminated the governing rules to Women's Committee Chairmen in the various companies.

The essay contest will be omitted this year, because of the immense amount of labor involved in its conduct, which is a real impediment under present working conditions. The same thing is true for the stunts contest, which has been a much appreciated Convention feature for some years past.

Jordan Named Chairman of Advertising Section

PRESIDENT Masser has appointed J. Charles Jordan of San Francisco as Chairman of the Publicity and Advertising Section of the Association. Mr. Jordan replaces Eugene P. Ramsey, who, on resigning from his position as avertising manager of the Los Angeles Gas and Electric Corp. to enter private business, found it necessary to relinquish has Association work.

J. Charles Jordan

Mr. Jordan is assistant manager of the publicity and advertising department of the Pacific Gas and Electric Co. and has long been a leader in public utility advertising circles. He has served as Chairman of the Publicity and Advertising Section of the Pacific Coast Electrical Association and is at present a director of the San Francisco Ad Club.

Industrial Sales Data Bulletins

THE Association recently mailed to industrial engineers the fourteenth number of a series of industrial sales data bulletins, each one describing in detail some new development or appliance in gas utilization or some successful conversion from other fields. These bulletins are sponsored by the Industrial Sales Committee, Commercial Section, and as their number grows will make a valuable reference file. Suggestions and data for future bulletins should be submitted to C. A. Thorp, Los Angeles Gas and Electric Corp., Chairman of the Bulletin Committee. The titles of the first 14 bulletins are as follows:

1. Deep Fat Fryer for Frying Doughnuts, Potato Chips, etc. Contributed by L. C. Haffner, Portland Gas & Coke Co.

2. Pastry and Roasting Oven with Top and Bottom Burners. Contributed by C. R. Miller, Portland Gas & Coke Co.

3. Laundry Stoves. Contributed by R. Edwyne Fisher, Pacific Gas and Electric Co.

4. Cocoa Bean Roaster Burner. Contributed by L. C. Lundquist, Pacific Gas and Electric Co.

5. Barrel Driers. Contributed by Frank E. Oettinger, Pacific Gas and Electric Co.

6. Core Oven . . . Car Type for Baking Cores and Molds. Contributed by Walter E. Lind, Pacific Gas and Electric Co.

7. Conversion of a 26-ft. Circular Tile Kiln. Contributed by Walter E. Lind, Pacific Gas and Electric Co.

8. Conversion of Sand and Gravel Dryer from Oil to Natural Gas. Contributed by L. P. Stoker, Pacific Gas and Electric Co.

9. Fifty-ton Galvanizing Kettle. Contributed by I. W. Lindlahr, Pacific Gas and Electric Co.

10. Production Survey of Meat Roasting Oven. Contributed by Geo. H. Heckler, Southern California Gas Co.

11. Lead Melting Pot. Contributed by E. J. Strickland, Southern California Gas Co.

12. Portable Potato Chip Kettle. Contributed by Geo. H. Heckler, Southern California Gas Co.

13. Firing Brick Kilns with Low Pressure Gas. Contributed by Chas. L. Ferry, Southern Counties Gas Co.

14. Conversion of a Knapp Continuous Hardening and Drawing Furnace from Electricity to Natural Gas; Also Two Knapp Forges from Oil to Natural Gas. Contributed by P. J. Collet, Los Angeles Gas and Electric Corp.

Campbell to Fill Cannon's Post With Honolulu Gas Co., Ltd.

A. N. Campbell has been named managing director of the Honolulu Gas Co., Ltd., Honolulu, Hawaii, to take up the work of Frank Cannon, for many years manager for the company, who passed away on March 5, following an operation.

1933 Calendar

May

Southern Gas Association—25th Annual Convention, Hotel Shoreham, Washington, D. C., May 2,3,4, 1933.

Commercial Section, American Gas Association—Southern Regional Gas Sales Conference, Hotel Shoreham, Washington, D. C., May 2,3,4, 1933

Natural Gasoline Association of America—Annual Convention, Tulsa, Okla., May 15, 16, 17, 1933.

American Petroleum Institute—Mid-Year Meeting, Tulsa, Okla., May 17, 18, 19, 1933.

Joint Conference of the Production and Chemical Committees, American Gas Association—Hotel New Yorker, New York, May 22-23, 1933.

Southern California Meter Association—Los Angeles, Calif., May 25, 1933.

June

Pacific Coast Gas Association—Northwest Conference, Olympic Hotel, Seattle, Wash., June 22-23, 1933.

September

Pacific Coast Gas Association—Annual Convention, Ambassador Hotel, Los Angeles, Calif., Sept. 13, 14 and 15, 1933.

Canadian Gas Association—Annual Convention, Ottawa, Can., Sept. 18, 19, 1933.

American Gas Association—15th Annual Convention, Chicago, Ill., week of Sept. 25, 1933.

Natural Gas Department, A.G.A.—Annual meeting, Chicago, Ill., September 25, 1933.

October

American Petroleum Institute—14th Annual Meeting, Chicago, Ill., Oct. 24-26, 1933.

1932 Revenue Increase Shown through Denver Company's Intensive Selling

WHILE Roy G. Munroe, gas new business manager, for the Public Service Co. of Colorado, admits that 1932 presented "the most trying business conditions in the memory of the oldest employee" he gives *Western Gas* indisputable evidence that proper methods and sufficient hard work can be relied upon to keep up sales volume—no matter what the conditions. Extracts from the company's annual report, covering 1932 gas new business activities in the Denver district, speak for themselves as far as sales results are concerned, and to these extracts is added a summary of the Denver company's sales policies last year, provided through the courtesy of Mr. Munroe. Quoting sections of the annual report:

Roy G. Munroe

Notwithstanding that vacant residences increased from 6.4 per cent at the commencement of the year to 7.7 per cent at the close of the year, while business vacancies increased from 6.9 per cent to 8.8 per cent, a comparatively small number of gas customers were lost, as reflected by a change from an excess of 167, January 1932 over January 1931, to 419 decrease, December 1932 under December 1931. The 1932 Denver district M c.f. sales were increased by 2.25 per cent over those of 1931 while the Denver gross gas revenues were increased by $30,362.

The 1932 sales of natural gas for domestic and commercial purposes of the average American gas company decreased 5.4 per cent under those of 1931, whereas Denver domestic and commercial gas sales were increased by .42 per cent. Similarly the industrial gas sales of the average gas company declined 15 per cent while Denver's industrial gas sales were increased by 7.9 per cent, and with most of Denver's industrial plants partially or wholly shut down. Included in the new equipment sold were 946 automatic water heaters, 196 manually operated water heaters, 710 fireplace heaters, 913 domestic gas ranges, 74 hotel ranges, 724 all-gas housheating installations (of which 281 were installed through dealers), 16 commercial bake ovens, 8 broilers, 7 incinerators, 309 miscellaneous industrial boilers, furnaces, burners, etc.

Although nearly 3000 housheating customers ordered their gas housheating discontinued during the year because of such reasons as—vacancies, tenants moved out, lower incomes, further reductions in coal prices, etc., due to intensive selling and reselling, 10,006 all-gas housheating customers were still using gas exclusively in December 1932 as compared with 10,110 during December of 1931. Gross-revenue comparisons show these increases in 1932 over 1931:

Domestic Gas Revenue	$ 2,324
Housheating Gas	$ 582
Commercial and Industrial Gas	$27,456
Total increase	$30,362

In reaching the results which are detailed above it is evident that the Denver company utilizes every available sales avenue. Naturally, the company relies chiefly upon a large force of outside sales representatives maintained from year to year. Many inducements are also offered to interest and encourage dealers in the sale of gas appliances; the company jobs through dealers, surveys houses free for them, and furnishes imprinted literature. In the Denver area, however, with coal being mined in the city outskirts the greatly reduced prices of this fuel have operated to lessen dealer interest in gas equipment and throw practically the whole load of sales promotion upon the gas compeny.

The following summary of outstanding points in the Public Service Co. of Colorado gas sales program is given in Mr. Munroe's own words:

First, we have concentrated upon load-building and expense-reducing programs, rather than upon merchandising volume.

Second, we have concentrated upon the more promotional or introductory use of gas such as house-heating, automatic water heaters, fireplace heaters, and commercial and industrial uses of all sorts, leaving the more staple equipment to the dealers, and selling only such gas ranges as our men pick up as they go, with no revenue-commission inducements to sell ranges at all.

Third, we pay our salesmen primarily to sell *gas,* not merchandise, premiumizing high load factor, off peak hours. We do this by a schedule of revenue-commissions as described in the July, 1929 issue of *Western Gas.* This compensation plan has stood the test of desperate business conditions wonderfully.

Fourth, we have concentrated on more calls, and better selling technique, as well as upon consistent advertising and lowered prices.

Fifth, we have stayed close to the selling technique in the A.G.A. course in Domestic Gas Salesmanship, all 52 of our men having taken it.

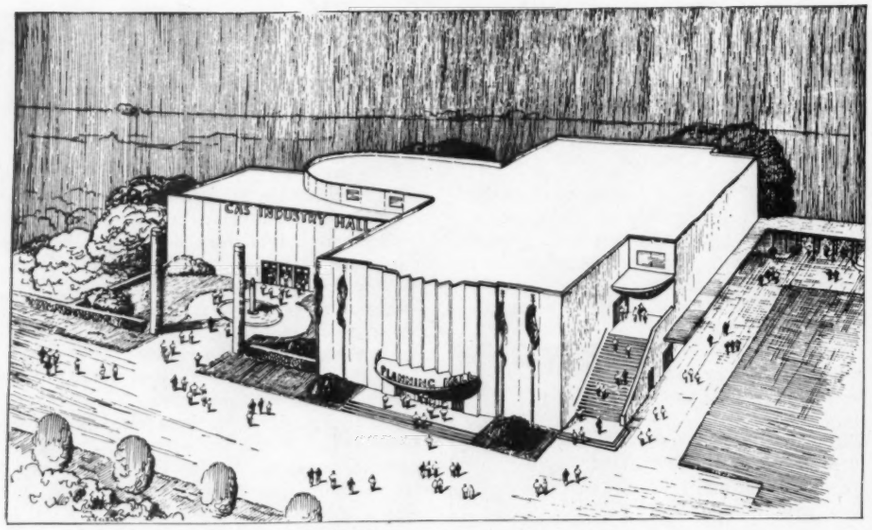
Sixth, we have gone from one intensive sales campaign and contest, to another all the year, dividing the men into baseball sales contests, team competitions, etc., without let-up.

Comparative Gas and Electric Range Sales for 1932

In 1932, the year of a nation-wide selling campaign on electric ranges, the sales of gas ranges in the United States continued to be approximately 10 times the sales of electric ranges.

Sales of electric ranges in 1932 were 27 per cent of the year's quota.

The decline in gas range sales in 1932 below 1931 was approximately 37 per cent, as against 49 per cent decline in the sales of electric ranges in the corresponding period.



Chicago Exposition Opening on June 1

CONTRIBUTIONS of the gas industry to world progress from 1833 to 1933 will be portrayed in the Home and Industrial Arts Group of the Century of Progress Exposition opening at Chicago on June 1. Above is shown an architect's drawing of the Home Planning Hall, the central building in the Group, fronting on Leif Erickson Drive, the exposition's main thoroughfare. The building provides 47,200 feet of exhibit space. A south annex to this structure is called Gas Industry Hall.

Developments in heating, plumbing, air-conditioning and household equipment and appliances will be featured in the building. There will be an exhibit sponsored by the American Gas Association, and several individual displays.

Company-Employee-Dealer Drive Sells 1044 House-Heating Units

HANDICAPPED in its sales development program by the Oklahoma anti-utility-merchandising statute passed in 1931, the Oklahoma Natural Gas Corp. has nevertheless adapted itself to new conditions and made considerable load-building progress during the past year. W. Jennings Young, general sales manager of this utility, gives *Western Gas* the following particulars on the major heating campaign, known as the "Gas For Home Comfort Campaign" which Oklahoma Natural conducted in 1932.

During the summer months an exhaustive appliance census was taken covering every home in the cities and towns in which the company operates. Preparatory to making the survey, company representatives called on gas appliance dealers to explain the proposed plan of house-heating promotion. Each dealer was asked to recommend a man to assist in making the survey, preferably an unemployed man with dependents and one who knew the community in question. Salesmen who formerly had been with Oklahoma Natural prior to passage of the anti-merchandising law, were also employed by the company in this work.

To insure that the survey crews would classify appliances properly, instruction was given to all employees before the census-taking got under way.

The survey was completed and tabulated by districts, and survey cards filed by districts and by appliances, were prepared. These cards were the ammunition for a united attack on house heating equipment sales.

From a previous house heating campaign in which company employees had been enlisted, the Oklahoma Natural was convinced of the value of tying in the effects of every employee in major campaign work. Therefore after the survey was completed the "Gas for Home Comfort Campaign" was announced to employees. Weekly pep bulletins were issued carrying out the theme of a broadcasting station known as GFHC, with the employees in the roles of guest announcers.

The objective of this campaign was to add 1000 heating units of 150,000 cubic feet annual load per unit. With employees thoroughly informed and enthusiastic to develop prospects, the next step was to contact dealers again. The company offered to organize a sales crew for dealers if they would pay the salesman a drawing account of $5 per month per line of appliance, deductible from a flat 10 per cent commission. Dealers readily accepted this plan knowing that with several salesmen representing them in door-to-door sales efforts the advertising which they received would alone pay the way.

Oklahoma Natural then proceeded to organize sales crews for the dealers and to supervise their work. Although the salesmen were not working directly for the utility they were required to report promptly each morning at the company offices for a sales talk. The above plan in conjunction with the company employee sales activities proved very successful, since prospects turned in by employees were immediately contacted by these dealer salesmen. A bonus schedule was set up for employees and prizes offered to winning districts. Employee meetings were held weekly with the gas appliance dealers and their salesmen attending. The survey information compiled by the company was open to the dealers, and their salesmen were each assigned an equal number of these survey prospects.

Arrangements were completed with manufacturers of several makes of conversion burners to cooperate with the gas company in installation of their equipment. The company also arranged with the various plumbers to establish a flat-rate fee, as far as possible, for installation of conversion jobs.

To pave the way for successful sales interviews, letters were mailed by the company to all prospective customers, briefly outlining the campaign plan and requesting that they permit an interview with one of the sales representatives who would give further details of a special offer. This offer permitted one conversion burner to be given free to each individual providing the names of three prospects which developed into ultimate sales.

The campaign ran for a period of five months, ending December 31, during which 1044 heating units or 104 per cent of the quota were added to Oklahoma Natural's lines, 271 units coming from direct sales leads provided by gas company employees.

Mr. Young states that the company is highly pleased with the present sales-mindedness of its employee personnel and intends to utilize this factor in future gas load-building contests. It is the intention to use some form of equipment rental plan during 1933 for house heating load promotion.

New Officers Inducted at Mid-West Gas Assn. Meet

R. L. Klar, Des Moines Gas Co., was elected president of the Mid-West Gas Association at the annual convention of that body, held at Des Moines, Iowa, April 10-12, 1933. Mr. Klar succeeds W. E. Derwent, vice-president of the Geo. D. Roper Corp., Rockford, Ill., the 1931-32 president. C. T. Williams of Sioux City, Iowa, was advanced from second vice-president to first vice-president, and F. H. Brooks, president of Northern Gas and Pipe Line Co., Omaha, Neb., was named second vice-president. R. B. Searing was re-elected secretary-treasurer.

Those named to the executive council include A. L. Fritchey, Pittsburgh, Pa., Frank W. Budd, Rochester, Minn., A. H. Abbott, Minneapolis, and J. H. Fagen, Milwaukee.

1932 A. G. A. Proceedings Ready for Distribution

The latest edition of the American Gas Association Proceedings, covering the annual convention held in Atlantic City last October, is now ready for distribution. The volume contains over 1000 pages, with illustrations, charts, statistics and tables representing a great amount of intensive work brought together in a carefully edited and effectively printed book. A comprehensive index makes the material easily accessible.

In addition to the General Sessions, the sections and departments included are: Accounting, Advertising, Natural Gas, Commercial, Industrial, Home Service, Manufacturers, and Technical. The prepared papers and reports are augmented by discussions bringing out the individual practices and experience of the gas men assembled.

Copies are available at offices of the American Gas Association, 420 Lexington Ave., New York City. The cost is $3 to members, and $7 to non-members.

W. B. Trammell Now Heads Houston Natural Gas Co.

W. B. TRAMMELL, vice-president and general manager of Houston Natural Gas Co., Houston, Texas, has been named president of that company, filling the place of E. H. Buckner who resigned on account of ill health.

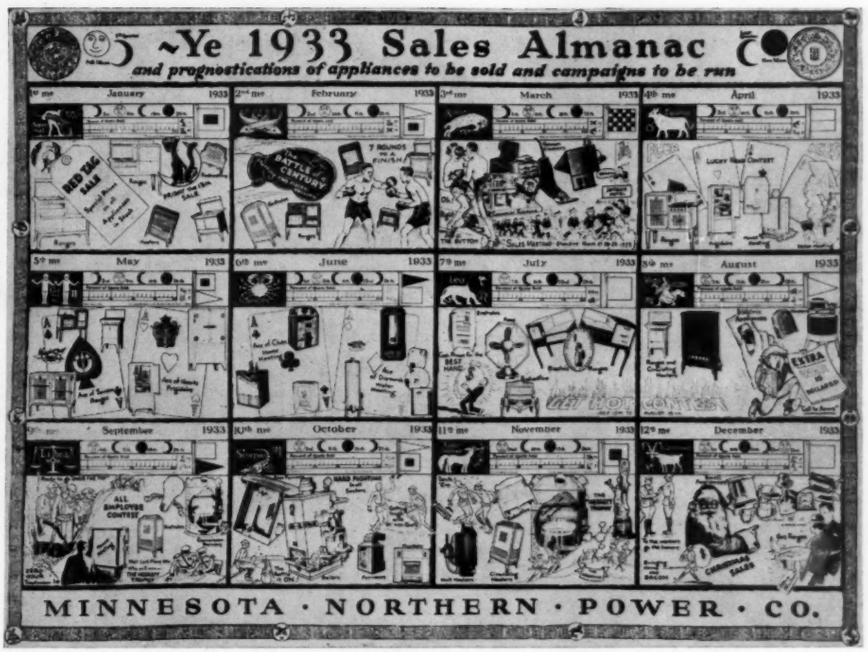
W. B. Trammell

Mr. Trammell has been vice-president and general manager of the company since its organization six years ago, and in assuming the position of president, becomes one of the youngest heads of an industrial institution in the United States, being but 31 years of age. He was graduated from the University of Texas in 1926.

Other officers elected include E. S. George, vice-president; D. P. Perkins, secretary-treasurer and J. H. Wimberly, auditor and assistant secretary. Mr. George was also named to the board of directors of the company.

Report on Oil and Gas Fields of Michigan Being Prepared

The Department of Conservation, State of Michigan, Lansing, is preparing a report entitled "Oil and Gas Felds of Michigan", by R. B. Newcombe, petroleum geologist of the Michigan Geological survey. It will be divided into two parts, Part I, General Geology and Part II, Economic Geology. The report will include 11 chapters and 350 pages and will discuss in detail the general stratigraphic and structural geology of the state. It will also include reviews of the Muskegon and Mount Pleasant fields up to January 1, 1933, together with discussion of the Howell structure in Livingstone county and other undeveloped structures.



1933 Sales Calendar for Minnesota No. Power

MINNESOTA Northern Power Co., headquartered at Minneapolis, and with distributing subsidiaries located in Montana, Minnesota, North and South Dakota has originated a novel method for visualizing its 1933 sales program. A. E. Schwarz, new business manager for the company, sends *Western Gas* a sales chart for the year in the form of the calendar reproduced above. The chart was hand colored and copies of it sent to district managers and other key executives of the organization.

Theo. M. Martin Co. Organized at Huntington Park, Calif.

THEO. M. MARTIN CO. announces the establishment of offices at 5905 Pacific Boulevard, Huntington Park, Calif., to specialize in advertising and sales promotion of tools and equipment for the oil and gas industries. The company is headed by Theo. M. Martin, formerly of Berry & Martin, Inc., and with him will be associated Wallace A. Sawdon and Lloyd C. Woods.

Mr. Martin has been in the advertising business for many years and was for two and one-half years advertising manager for the Oil Tool Division of Byron Jackson Co. He has specialized during the past 10 years in industrial sales promotion, advertising and publicity. Mr. Sawdon has been in the advertising and publicity business for the past 3 years and before that was in editorial work on an oil trade publication. Due to his experience and training as a petroleum engineer he specializes on technical accounts. Mr. Woods was formerly eastern advertising manager of a large national organization in New York, and just before moving to California was an account executive on outdoor advertising.

To Build Plant at Guymon

The citizens of Guymon, Okla., recently voted in favor of constructing a municipal plant and system for distributing natural gas. Supply would come from the Guymon field.

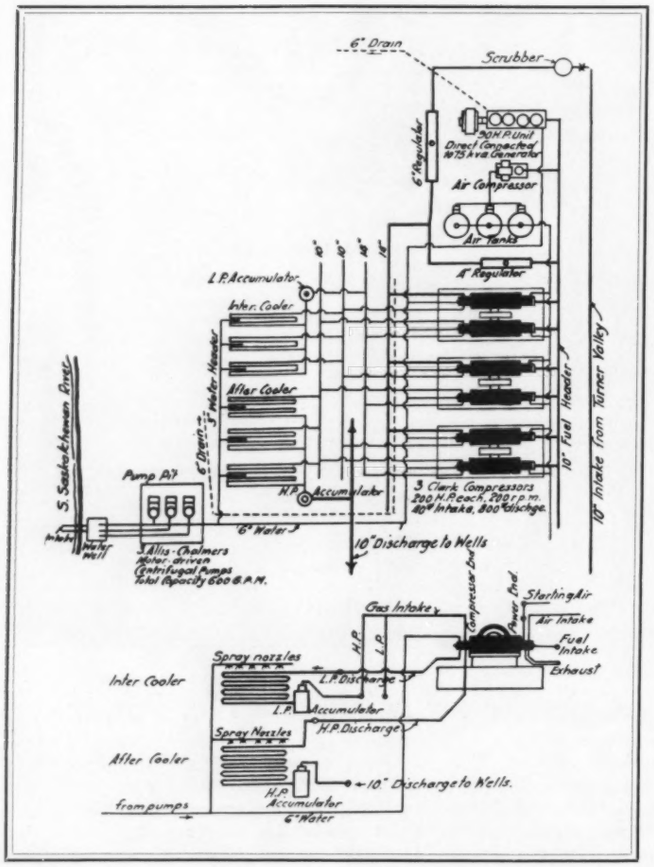
Henderson Named to Board of Southern Counties Gas Co.

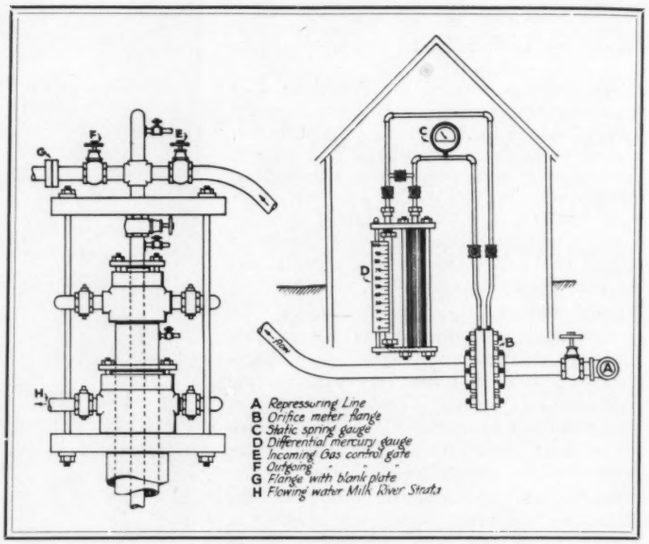
The election of Charles S. Henderson of Long Beach to the board of directors of Southern Counties Gas Co., Los Angeles. Calif., to fill the vacancy caused by the death of A. S. Bradford, who had served continuously on the board for 20 years, was announced on April 20.

Mr. Henderson is a former city manager of Long Beach, was also president of the Long Beach Chamber of Commerce and the Long Beach Rotary Club and is well known throughout Southern California for his constructive leadership in civic and commercial affairs.

Joint Production and Chemical Conference May 22-23, 1933

A conference of the Production and Chemical Committees of the American Gas Association will be held at Hotel New Yorker, New York, on May 22 and 23. 1933. The program has been prepared jointly by the two committees and is designed to bring up for discussion the most important of their activities. In addition, papers are provided on certain outstanding developments such as Production of High B.t.u. Oil Gas to Augment Supplies of Natural Gas; Purging of Works Apparatus; Symposium on the Gum Problem, etc. There will also be the usual open forum.




A Repressuring Line
B Orifice meter flange
C Static spring gauge
D Differential mercury gauge
E Incoming Gas control gate
F Outgoing " "
G Flange with blank plate
H Flowing water Milk River Strata

AT LEFT:

General layout of compressor plant, Bow Island gas field.

AT RIGHT:

Sketch showing typical well hook-up.

Storing Gas in the Bow Island Field

(Continued from Page 21)

tings and orifice meters. Field lines were relaid and made tight by welding all joints.

Compressor Plant: In order to overcome rock pressure in the existing wells and to ultimately force back encroaching water pressure which is estimated at 750 pounds, it was necessary to install compressors capable of handling high gas pressure. Three two-stage 200 H.P. direct driven gas engine compressors, manufactured by Clark Bros., Olean, N. Y., were installed in an all-steel building, having a combined capacity of three million cubic feet daily at 40 pounds intake and 800 pounds discharge pressure, or approximately five million cubic feet delivery at 400 pounds discharge.

The auxiliary equipment installed in conjunction with the compressors consists of a 90 H.P. direct driven gas electrical unit which supplies power to three electric water pumps, a 10-inch water intake pipe line, necessary settling sumps, and water reservoir, six sets of pipe coils for cooling of the compressed gases, gas scrubbers, air starters, etc.

All piping work in connection with the plant was acetylene welded and tested at 500 pounds air pressure. The arrangement of the piping is such that the operation can be reversed, if necessary, and gas sent out of field either through the compressor plant when required, or under natural pressure. Provision is also made for the enlargement of the whole scheme if necessary.

RECHARGING, AUG. 1930-DEC. 1932

From the commencement of operations Aug. 3 to Dec. 31, 1930, gas stored for 5 months amounted to	622,957 M c.f.
During the year 1931 gas stored amounted to	1,533,559 M c.f.
During the year 1932 gas stored amounted to	1,405,779 M c.f.
Total gas stored to date, Dec. 31, 1932	3,562,295 M c.f.

The average rock pressure of the field at commencement of operations was 248.7 pounds, average rock pressure December 31, 1932, was 404 pounds. Increase in rock pressure is approximately 155 pounds.

The company feels that it has been justified in the expenditure incurred and that a high pressure gas field connected to its transmission system is being built up and will be available for use during peak load demands and emergencies or as a reserve supply for future use.

Note: The Canadian Western Natural Gas, Light, Heat & Power Co., Limited, supplies gas to the cities of Calgary, Lethbridge and 19 other towns. Total number of consumers 24,000. The company owns and controls three gas fields but purchases all of its supply at present from the Turner Valley field. Annual sales of domestic, commercial and industrial consumers is approximately seven billion cubic feet. Rates charged are on a sliding scale from 33c to 15c net.

Republic Steel Corp. Publishes Booklet on Properties of Toncan Iron

Republic Steel Corp., with general offices in Youngstown, Ohio, brought from the press in April a new advertising folder on the "Properties of Toncan Iron." The booklet contains complete data on the various properties of Toncan copper molybdenum iron, the material having been compiled by the Toncan Iron Metallurgical Dept., of the Republic Steel Corp.

New Company in Alabama

United Gas Systems, Inc., has been incorporated at Mobile, Ala., for the purpose of operating gas wells and for constructing natural gas pipe lines in the state. Officers of the company are named as Horace S. Turner, president, and Robert H. Smith, secretary-treasurer. Headquarters will be at Mobile.

Community Moves Snyder Office

Offices of the Community Natural Gas Co., Snyder, Texas, have been moved to a new location to facilitate the display of gas appliances.

COMMITTEE:
DOUGLAS BUCKLER . SO. CALIF. GAS CO.
J. EARL JONES . . . SEATTLE GAS CO.
J. CHARLES JORDAN (CHAIRMAN) P. G. & E.
F. U. NAYLOR . . . . . P. G. & E.
D. L. SCOTT . . . . L. A. G. & E. CO.

HEADQUARTERS:
PACIFIC COAST GAS ASSOCIATION
447 SUTTER STREET SAN FRANCISCO
H. L. MASSER (L. A. G. & E. CO.) PRESIDENT
CLIFFORD JOHNSTONE, MNG. DIRECTOR

P.C.G.A. NEWS

CO-OPERATIVE ADVERTISING

TECHNICAL NEWS SERVICE

To the 21 articles published during January and February, are added 11 (listed below) printed during March. All were prepared especially for these magazines by our Technical News Service.

WESTERN MACHINERY AND STEEL—Gas Fuel and Draft Control for Industrial Plants—2 pages. Modern Equipment in a Glass Factory—Gas fired normalizing and annealing at Owens-Illinois Pacific Coast Co., San Francisco—3⅓ pages.

WESTERN BAKER—New Lamnor Plant Opens in San Francisco—1 page.

PACIFIC COAST RECORD—New Potato Chip and Deep Fat Fryer Creates Interesting Comment—¾ page.

WESTERN RESTAURANT—Ye Golden Lion Tavern is San Diego Landmark—1 page.

PACIFIC DAIRY REVIEW—Automatic Damper Control in Three California Dairies—2½ pages.

PACIFIC LAUNDRY JOURNAL — Makes Specialty of Fast Service—Gas boiler plant in Texas Steam Laundry—1½ pages.

ARCHITECT AND ENGINEER—Automatic Draft Control for Small Boiler Plants—2½ pages.

PACIFIC FACTORY—Advantages of Automatic Combustion Control—Gas heating and cooking at Hotel Rosslyn, Los Angeles—⅔ page.

WESTERN HOTEL REPORTER—Rosslyn has Efficient Steam Boiler Plant—Gas heating and cooking at Hotel Rosslyn—⅔ page.

KEELER'S PACIFIC HOTEL REVIEW—Gas Saves Fuel at Beverly Hills Hotel—⅔ page.

MAY SCHEDULE OF ADVERTISING

Of the 19 Pacific Coast publications carrying the 1933 Trade Journal Campaign, the following will be used during May:

APPLIANCE DEALERS—Western Plumbing and Heating Journal, Western Appliance Retailing.

ARCHITECTS, BUILDERS—Architect and Engineer, California Arts and Architecture, Pacific Builder and Engineer, Southwest Contractor and Builder.

HOTELS, RESTAURANTS, CATERERS—Hotel News of the West, Pacific Coast Chef, Western Hotel Reporter.

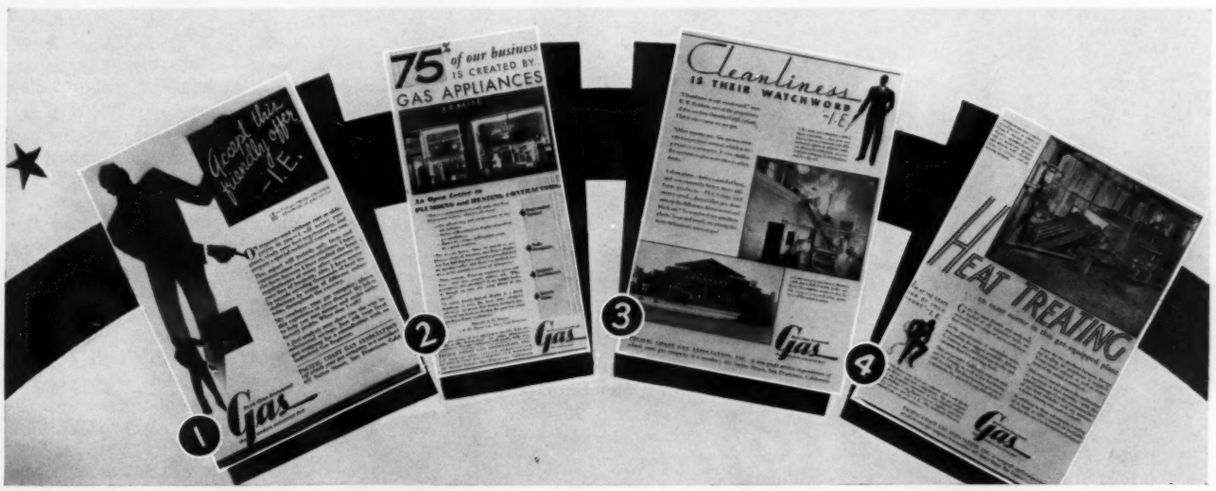
MISCELLANEOUS—Western Baker, Western Confectioner, Pacific Dairy Review, Pacific Factory, Pacific Laundry Journal and Dry Cleaner, Western Machinery and Steel.

The Campaign Slogan . . .

Quick Clean Economical **Gas** *the modern industrial fuel*

WATCH this page monthly for more news and views of the Co-operative Advertising

SOME OF OUR NEW ADVERTISEMENTS



(1) A "general" message, featuring I. E. (the Industrial Engineer) and his free services to various lines of Industry.

(2) This ad presents one of the strongest testimonials by a PLUMBER on gas appliances ever published in the West.

(3) A powerful statement by a Southern California creamery executive. ("Pacific Dairy Review" is the journal used.)

(4) "Western Machinery and Steel" and "Pacific Factory" carry this impressive statement on gas heat-treating.

Soil Corrosion Conference Papers

(Continued from Page 19)

Red Water Experiences at Washington, D. C. —Carl J. Lauter, Chief Chemist, Washington Filter Plants, Washington, D. C.

Preliminary Measurements of Required Current Density and Related Phenomena in the Electrical Drainage of Pipe Lines—Wm. Thompson Smith, Ford Bacon & Davis, Inc., New York, N. Y.

The Nature of the Corrosion-Time Relationship of Iron—R. F. Passano, American Rolling Mill Company, Middleton, Ohio.

Locating Pipe Line Inspection Points—Stanley Gill, Consulting Engineer, Houston, Texas.

Corrosion of Bare Lead Sheaths of Cable in Ducts—Howard S. Phelps, Philadelphia Electric Co., Philadelphia, Pa.

Corrosion of Mechanical Joint Bolts—A. V. Smith, Electrolysis Engineer, United Gas Improvement Co., Philadelphia, Pa.

A Method for the Measurement of Flowability as Related to the Practical Application of Hot Bituminous Coatings—F. W. Yeager, Barrett Co., Edgewater, N. J.

Comparison of Corrosion Survey Recommendations to Pipe Line Corrosion—J. Campbell Stirling, Stanolind Pipe Line Co., Tulsa. Okla.

The Corrosion of Casings of Water Wells by Electrolysis — Sheppard T. Powell, Baltimore, Md.

Distribution of Corrosion of Pipe Lines—Stanley Gill, Consulting Engineer, Houston, Texas.

Corrosive Effects of Horizontal Soil Strata—Ira D. Van Giesen, Department of Water and Power, Electrolysis Division, City of Los Angeles.

An Administrative Routine for Electrolysis Testing of Lead Sheath Cables—C. E. Pierce and M. A. Sawyer, Southern California Telephone Co., Los Angeles, Calif.

Corrosion on Submarine Loading Lines—F. N. Fosatti, J. F. Putnam, and H. P. Zeh, Standard Oil Co. of California.

A Pipe Protection Method—C. Goldkamp and C. P. deJonge, San Diego Consolidated Gas and Electric Co., San Diego, Calif.

Another Active Air-Conditioning Department

ENTRY of utility companies into the fast-growing air-conditioning field is gradually gaining momentum. *Western Gas* has already reported the organization of several air-conditioning departments, and is glad to pass on the following facts concerning the Public Service Electric and Gas Co. of Newark, N. J., which has recently entered the field. H. P. Morehouse has been named general air-conditioning representative for the company and supplies the information below.

Responsibility for promotion of this load was logically placed with the company's househeating department, since its members were already conversant with fundamental principles of heating. In order that their title should be more embracing and indicative of their expanded field these men were given the new title of air-conditioning representatives. The company's plan for 1933 calls for the following procedure:

1. Train the men in year around air-conditioning. To accomplish this all men are taking a course offered by the Extension Division of Rutgers University in air-conditioning. This course was specially prepared and covers both gas and electric phases.

2. Make a survey of all comfort cooling installations on the company's lines.

3. Prepare a list of names for direct-by-mail campaign. These names all to be in the commercial classification, viz.: restaurants, tea rooms, candy and soda shops, banks, barber shops, beauty parlors, dress shops, offices, department stores, clubs, etc.

4. Direct-by-mail campaign consisting of three Spring mailings with personal follow-ups.

5. Prepare a booklet descriptive of summer commercial cooling to be distributed to prospects.

6. Newspaper advertising.

7. Solicit prospects for summer cooling in the better class homes.

The company's present policy for summer cooling activities does not call for merchandising the equipment. Cooperation will be given all recognized manufacturers of air conditioning equipment.

Customer Sales Show Gain for Gas Service Company

THE Gas Service Co., Kansas City, Mo., of which F. M. Rosenkrans is new business manager, in summing up its 1932 sales promotional program shows an increase of 1300 cubic feet per customer in domestic consumption throughout its properties. Consumption increased from 80,700 c. f. in 1931 to 82,000 c. f. in 1932 per customer. Total domestic sales for 1932 were off only 9/10 of 1 per cent, accompanying a 2.4 decrease in average number of customers.

Aggressive load-building policies were maintained throughout the year. In Kansas, where the statute prohibiting utility selling of appliances went into effect in 1931, the Gas Service properties have been able to continue sales work under a court injunction.

Total appliance sales of Gas Service Co. new business departments amounted to $689,869, including 11,264 individual appliances. In this total were numbered 3711 domestic ranges, 1550 storage water heaters, 1999 small radiant type heaters. Additional heating equipment sold included 384 gas-designed furnaces, 699 conversion burners, 1351 large capacity radiant circulator type heaters.

Industrial gas sales dropped by 25 per cent on the Gas Service properties.

Reports on Gas Service Co.'s appliance sales for the first three weeks of April show gross sales amounting to $27,000 throughout all the properties, with expectations set at the $40,000 mark as the grand total for the month. The water heater sale now in progress is one of the most important specialized efforts of the year both from the standpoint of additional gas load and that of added appliance sales.

PowerStat Corp. to Market Automatic Safety Device

A NEW automatic safety device for gas pilot control has been developed on the Pacific Coast by the Watrola Corp., Ltd., San Francisco, Calif.

The new device, together with other safety equipment, will be marketed under the name "PowerStat" by a corporation already formed bearing the same name.

Heading the new corporation is Arthur F. Erickson, until recently Pacific Coast distributor for Minneapolis-Honeywell Regulator Co., and previous to that head of a company bearing his own name which manufactured and distributed control equipment.

The new control is a mono-metal alloy device, or robot, which, as contrasted with a bi-metal thermostat, has the characteristics of a movement of 30-thousandths; with a complete cycle in seconds; with practically unvarying speed under widely varying temperatures; with a pulling power of 30 to 50 pounds and upward; with a fatigue point beyond the temperature of ordinary fireboxes, and it is not a thermostat. It forms the activating control member in conjunction with a new carbureting pilot light burner having the inherent ability of purging itself of gas gum.

The company will also distribute Watrola gas and liquid strainers, and sealing gum. The strainers are of new design and it is said that they are capable of stopping particles of foreign matter as fine as 4-thousandths. Tests show that such fine strainers cause little pressure drop in gas or light liquids. The sealing gum, according to the manufacturer, has the peculiarity of non-dripping, non-drying, and permanently sealing joints in manufactured, natural or propane gas lines.

Associated with Mr. Erickson in the development of the PowerStat line is Allen W. Widenham, formerly in the gas utility industry, later a sales executive, and has been identified with a gas appliance research development program more recently.

J. E. Smith to Manage for United at Orange, Texas

J. E. Smith has been appointed manager for United Gas Public Service Co., at Orange, Texas, succeeding H. E. Dorrell. Mr. Smith was formerly with the company at Beaumont.

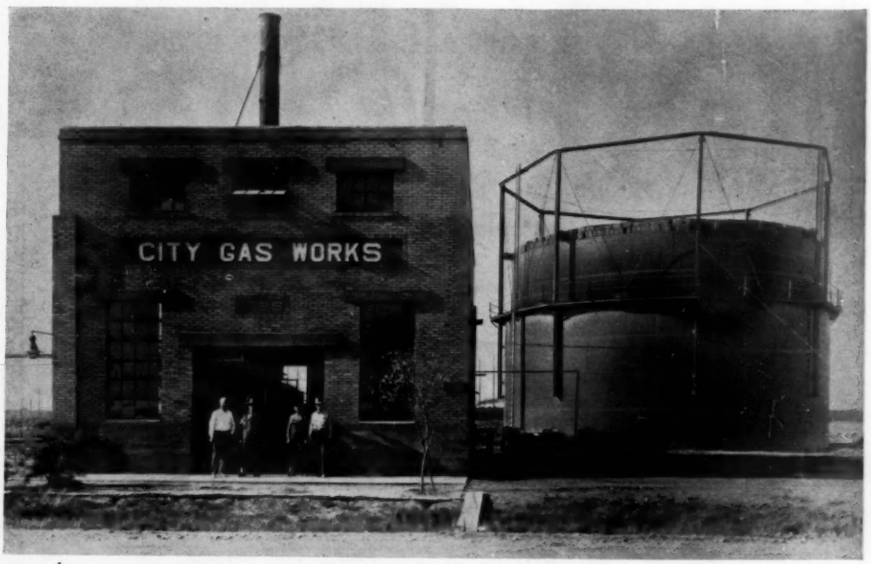
BUTANE - PROPANE NEWS

Covering Liquefied Petroleum Gas Service

Replacing Oil Gas at Winslow, Ariz.

By H. G. LAUB

Formerly General Superintendent, Occidental Gas Securities Company



Plant and holder of the Winslow Gas Co., constructed in 1925 for municipal distribution of oil gas, now on butane-air.

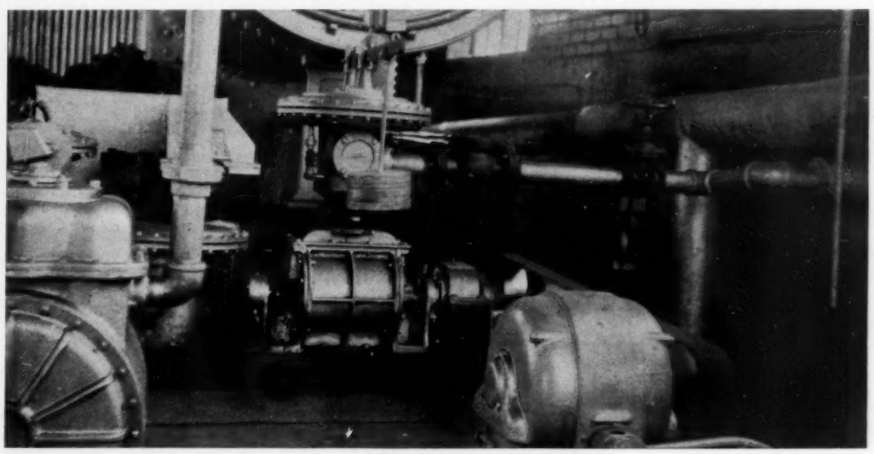
IN PREPARING a short sketch of the Arizona Gas Co. experience in changing over the gas service at Winslow, Arizona, from oil gas to butane-air gas it is believed that a few words on the nature of this community will supply an interesting background.

H. G. Laub

Winslow is one of the progressive and growing towns of northern Arizona, situated on the Santa Fe Railroad approximately 120 miles from the New Mexico boundary. It is a major division point on the railroad, large shops and refrigeration plants being maintained; headquarters for the Fred Harvey Indian Detours for the Hopi and Navajo Indian Schools and Reservations situated to the north, and for cattle and sheep ranchers who use northern Arizona for a summer range for their stock. The Indian Service is now constructing a $250,000 hospital for the medical care of the Hopis and Navajos, and, incidentally, will use gas for cooking, hot water and auxiliary heating.

The town and its environs have enjoyed a steady growth during the past two decades. The population of the city in 1930 was 4,000, with an additional 1,500 living immediately adjacent to but not included in the city limits. By actual count the gas company has in excess of 1,200 potential consumers, domestic and commercial, on its distribution lines, with an average investment of approximately 50 feet of mains per potential consumer.

Gas was originally installed in Winslow in 1917. A straight shot, single generator oil gas plant was built, with a small 10 M c.f. low pressure holder for standby. Approximately 18,000 feet of 6-, 3-, and 2-inch screw pipe was laid. No protective coating was used. Later an additional 8,000 feet of 2-inch was laid. In 1920 this system was sold to the City of Winslow, and was operated as a municipal enterprise until 1931.



View showing equipment following change-over from oil gas to butane-air. On the left is a large positive displacement vapor meter; center, positive proportioning machine and motive power, and on the right a horizontal vaporizer.

Municipal Service

For those who are interested in municipal ownership, the experience of this city should furnish food for thought. The original system was purchased for some $22,000. Two years after the purchase an additional $12,000 was invested in the installation of some 6,000 feet of 2- and 3-inch screw pipe and in plant betterments. From an operating standpoint, fairly good gas service was maintained. From 1922 on, however, the character of service deteriorated. To overcome this the city invested another $50,000, this time building a new 50 M c.f. low pressure water seal

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holder, new brick plant building, new straight shot generator, scrubber, purifiers, etc. With this new equipment, service was improved but was still not entirely satisfactory.

Apparently no records were kept of the amount of gas made or sent out. It is estimated, however, that in excess of 50 per cent of the plant sendout was lost through leakage in the obsolete portions of the distribution system before reaching the consumer. The distribution system became so undependable that at times portions of the city would be without gas for several weeks at a time, thus necessitating the use of substitute fuels by gas customers. The inevitable result was a falling off of patronage and an undermining of public confidence in the dependability of any type of gas service. The number of consumers of all types steadily decreased from 650 in 1924 to 190 in July, 1931. The overhead and maintenance still remained high and the city spent increasing sums to bolster up a depleted system producing steadily decreasing revenues. The experience of Winslow had proven again the generally accepted fact that a community, especially in the small population brackets, cannot operate a municipal gas plant successfully over a period of years.

In making a survey of conditions for the Arizona Gas Co. preparatory to construction, as careful an inspection as possible of the old distribution system was made. It was found that deposits of tars, naphthalene, etc., had in places almost completely plugged the mains. In addition, the system was badly filled with water. No records of the size or location of mains, nor of services or service connections were available, making an intelligent survey almost impossible. The soil for the most part is a heavy red adobe with some alkali in spots. Drainage is fair. Pressure charts from the old system taken at numerous locations, gave pressures from 25 inches water column at the plant to ½ inch water column on the outer edge of town.

Distribution System Rebuilt

From the results of our survey it was determined to abandon the old lines and install a modern distribution system. In working out the design for the new lines, the layout of the town was such as to permit the practical elimination of dead end mains. Four- and 6-inch lines divided the town into four sectors; a 3-inch line ties the ends of the 4- and 6-inch together. Two-inch laterals were strung between these circulating loops. The pipe installed was standard weight, dipped in petrolastic asphaltum, 40-pound felt wrapped with another layer of asphaltum and Kraft paper outside. The design of the distribution system permits perfect circulation of gas, easy division of the town into districts and great flexibility of operation. While the load has tripled since construction there has been little drop in line pressure. In normal operation, gas leaves the plant at 13 inches water column, yet the latest tests indicate the maximum drop was only 3 inches during peak load. This may seem rather a high pressure for appliances and correct measurement of gas, yet it has been the company's experience that butane gases require more pressure at the appliance for satisfactory results than do the lighter gases.

In the construction of the new system it was originally planned to operate the old

system during the entire period of construction and change-over. However, when ditches were opened in proximity to the old lines and the earth adhering to the old pipe disturbed, leakage became so bad that it not only became dangerous, but the old plant could not make gas as fast as it was lost. This necessitated building of the new system in districts, cutting in as a portion of the old system as tests were complete. Considerable water entered the new system from the old because of this necessity, although precautions in the nature of drips and blow-offs were installed.

The plant design is as simple as it is possible to make an air-mixed butane plant. The plant is manually controlled, for the reason that electrical service is frequently interrupted; therefore, automatic installation would prove of little use. Liquid butane is stored in two 10,000-gallon tanks just in rear of the plant building. From here liquid is passed through a liquid regulator to a tubular heat exchanger at 10 pounds pressure. Water temperature of 120 degrees F. is maintained on the exchanger by an automatic gas water heater. Emerging from the exchanger as a vapor, it is passed through a vapor regulator, through a meter to a positive proportioning machine. From here the proportioning machine either fills the 50 M c.f. holder or pumps into the line directly, or both. The proportioning machine is actuated by a single phase, 110-volt electric motor, connected by a belt. Auxiliary power is maintained by a standby gasoline motor. Calibration tests are made semi-annually to determine the actual hourly capacity of the proportioning machine for making B.t.u. calculations. Numerous tests have been made to determine the thermal consistency of the gas both by Orsat and calorimeter. No difficulty has been found in maintaining 550 B.t.u. gas. Analysis of each shipment of butane is kept, as well as a careful record of the number of hours the plant is operated each day and the amount of butane vapor fed the proportioning machine. From these records is computed the B.t.u. per cubic foot of gas made. These calculated B.t.u. values are found to compare very favorably to the results obtained from analysis.

Operation of the plant is so simplified as to allow the plant operator to repair meters and handle store room details. Sufficient room was made in the plant building upon the rearrangement of equipment to house the new plant, provide for an excellent small meter shop, and store all supplies.

Meeting Winter Conditions

Because Winslow has winter comparable to the Middle West some difficulty was encountered during the first winter from moisture collecting in meters and services from water that entered the system during construction. Denatured alcohol was used to thaw individual services and steps were taken at the plant to produce a completely dry gas. This was done by placing a heavy oil seal on the water in the holder and forcing all air entering the mixing chamber of the proportioning machine to pass through trays of calcium chloride. In addition to drips and blow-offs, this dry gas completely removed the water menace in about three months.

It was expected that some difficulty might arise from the use of this dry gas in drying

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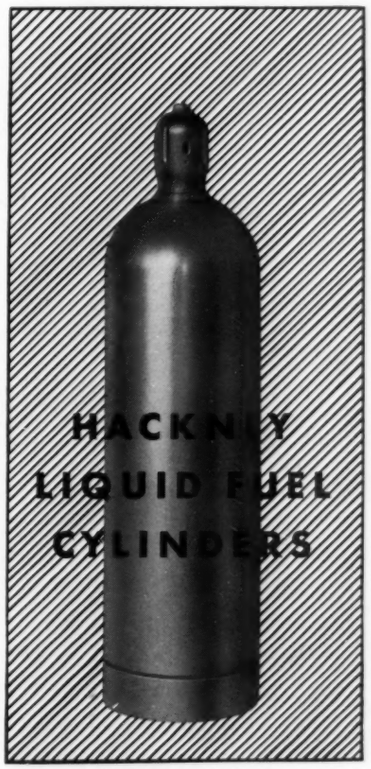

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the diaphragms in meters. Careful watch has been maintained on meter diaphragms since construction of the new system, and while there has not been a great deal of elapsed time to complete a study of this nature, to date no appreciable speeding of meters has been encountered, nor do the results indicate any tendency in this direction.

The effect of butane gases on diaphragms is also being watched in the two straight vapor plants operated by the company, in conjunction with a comparative study of the operating and maintenance costs of these two types of plants.

Restoring Confidence in Gas

The real problem confronting the company in developing this property has been one of public relations. It is a real task to convince potential consumers that dependable gas service is available, especially after a series of years of unsatisfactory service under municipal ownership.

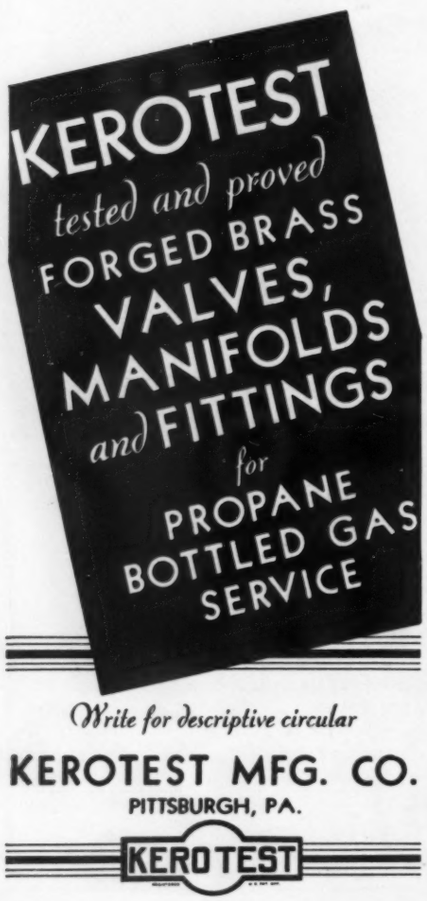
Special sales campaigns, cooking schools and contests have been conducted and special merchandising methods employed. Rental of appliances and immediate attention to service complaints have all helped in re-educating the public to gas service. As evidence of the growth of interest, the first publicity attempted was a cooking school with valuable prizes given away as an inducement to attend—the average daily attendance being 47. Nine months later another cooking school held in conjunction with a local store and with fewer inducements, had an average daily attendance of 136. The latest scheme was a letter-writing contest on "Why I Prefer Gas for House Heating," which brought in over 200 replies. These sales and educational methods, coupled with personal contact by the local manager, has more than doubled the customers (which now number about 500) and almost tripled the sendout in 14 months.

Skelgas Co. to Build $1,000,000 Plant

PLANS for immediate construction of a $1,000,000 plant for the manufacture and bottling of liquefied petroleum gas at Minneapolis, Minn., were announced the middle of April by the Skelgas Co., subsidiary of Skelly Oil Co., Kansas City, Mo.

The building will be of steel and concrete construction, and will house the necessary machinery and equipment. A site for the plant was purchased from the Pioneer Oil & Gas Co. last year at 4546 Humboldt Ave., Minneapolis. The new structure will be completed in about two months, according to Frank J. Lee, district manager for the Skelgas Co. at Minneapolis, who will also have charge of the plant.

The project was made known to 200 Skelgas dealers and sales representatives from the Dakotas, Wisconsin and Minnesota, at a meeting held in Minneapolis on April 12. G. B. Turner, general sales manager and T. M. Feely, assistant sales manager, both of Kansas City, Mo., conducted the sessions, assisted by Mr. Lee. District sales officials in attendance were E. S. Etikson, L. S. Bustard and A. F. Busse.



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Utilities Distributors, Inc., Meet At Portland, Maine, May 4

Utilities Distributors, Inc., of Bangor Maine, distributors of bottled gas in Maine, Vermont and New Hampshire is holding its spring dealer's meeting in Portland, Maine, on May 4. Approximately 70 dealers are expected to attend the meeting. Representatives of a number of the equipment manufacturing companies as well as a representative of Philgas Co., manufacturer of the fuel supply, will address the meeting. Peter A. Anderson is president of Utilities Distributors Inc.

Standard "Flamo" Used on Board Research Craft

The 75-foot cruiser "Catalyst," recently set afloat at Seattle, Wash., for the University of Washington with funds supplied by the Rockefeller Foundation, is equipped for gas service, with water heater, range and Electrolux refrigerator, all fuelled with Standard Flamo through a 4-cylinder installation. The little craft is designed for use in scientific research work in the study of oceanography of the Pacific Northwest.

Stamford and Western Demonstrates "Stargas" at County Fair

As a part of its participation in the Hamlin, Texas, Tri-County Fair, the Stamford and Western Gas Co. demonstrated the use of "Stargas," manufactured by Lone Star Gas Co., parent of the Stamford and Western Gas Co. A model kitchen was set up, with refrigerator, water heater, range, and lights, all fuelled with liquefied petroleum gas.

Ask Extension of Permit to Serve Butane Gas at Mayfield

The Mayfield-Kentucky Gas Co., Mayfield, Ky., has asked for an extension of time in which to begin butane service in Mayfield. Louis Greenspon, president of the company, which headquarters in St. Louis, Mo., states that service will begin about January 1, if the extension is granted.

Sun Oil Co. to Equip Refineries for Recovery of Propane

Sun Oil Co., Philadelphia, Pa., is planning to equip three of its refineries for recovering propane from petroleum oil through a process developed in its refinery. The plants which will have the new equipment installed are located at Marcus Hook, Pa., Toledo, Ohio and Yale, Okla.

The company expects to begin marketing propane about July 1, according to word received from A. E. Pew, vice-president of the company. The division of the company's sales department which will handle the product is now being organized and trained in the special applications of the product.

Survey of Properties of Eastern Shore Gas Co. Made

Brokaw, Dixon, Garner & McKee, geologists and petroleum engineers of New York, have recently surveyed the properties of the Eastern Shore Gas Co. of Pocomoke, Md., for interests which are negotiating for its purchase. Eastern Shore Gas Co. operates central butane plants at Pocomoke, Ocean City and Snowhill, Md., and in Chincoteague, Va.

R. E. Aitcheson Buys Control of Sapulpa Gas Co., Sapulpa, Okla.

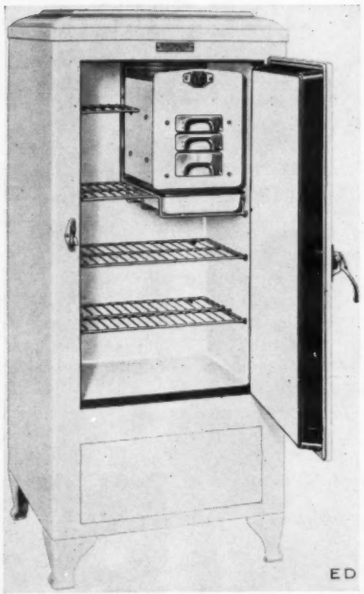
R. E. Aitcheson, formerly with Natural Gas Corp. of California, is now president of the Sapulpa Gas Co., Sapulpa, Okla., having purchased the physical properties and most of the common stock of that company. A reorganization plan has been under way, with all of the properties now combined as the Sapulpa Gas Co., serving the city of Sapulpa and suburban customers, and operating 75 miles of gas transmission lines.

T. E. Donaldson is secretary-treasurer of the company.

Nevada, Mo., Franchise Asked

Cyr Gas Co., Hume, Mo., has applied for a franchise to serve natural gas in Nevada, Mo.

New Electrolux Air-Cooled Unit Proves Stimulus to Sales



The new air-cooled Electrolux is already available in 3-, 4-, 5-, 6-, and 7-foot domestic models

DEVELOPMENT of the new air-cooled Electrolux gas refrigerator, announced within the past few weeks by Electrolux Refrigerator Sales, Inc., has been welcomed by utilities and dealers throughout the industry as a decided stimulus to sales. The new box is made in five domestic sizes and ultimately will be available in all sizes.

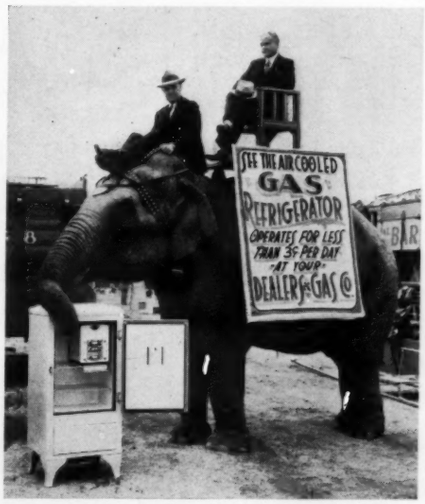
Elimination of water in the cooling process represents a saving in operating, installation and servicing costs. In addition to air-cooling, the gas refrigerator has two-temperature control with a five-variant temperature regulator. This decreases the freezing time and provides non-stop defrosting. Another development is a trigger device on each ice tray to facilitate easy removal.

The air-cooling development is the result of several years laboratory work on the part of Electrolux engineers. In most respects the unit is quite similar to the water-cooled Electrolux. The main refrigerating cycle is much the same. A small gas flame applied to the generator containing a 30 per cent solution of ammonia and distilled water vaporizes the ammonia and starts it on its cooling process.

Flowing on to the condenser, the ammonia gas is liquefied by the cooling action of the room atmosphere over the fin-type coil. The room temperature in no wise affects the refrigerating efficiency, as the ammonia condenser in the new unit is of two-channel construction; when the load is light the ammonia passes through only a part of the coil, but when the room temperature is higher and the load heavier the ammonia automatically flows through the entire coil, subjecting it to a greater cooling surface.

From the ammonia condenser the liquid ammonia then passes into the lower section of the evaporator, which is of new and radical construction. It is of the two-temperature type, with a low temperature freezing coil directly in contact with the ice trays and an upper or secondary coil which is used for cooling the box as a whole when the necessity demands. Hydrogen gas within the refrigerating cycle, flowing in counter-direction from the ammonia, produces a rapid evaporation of the ammonia, thereby withdrawing heat from the ice trays and the box and thus causing refrigeration to take place.

As the ammonia evaporates in the presence of hydrogen, the mixture which is heavier than hydrogen itself flows by gravity downward through the heat exchanger into the absorber. The upper section of the absorber is in direct connection with the weak



Circus publicity heralded the air-cooled Electrolux in Southern California

liquid portion of the generator and by means of gravity the weak liquid flows over the baffle plates within the absorber, absorbing the ammonia gas from the mixture in the absorber. This strong liquid then flows down to the bottom of the absorber, passing through the liquid heat exchanger and back to the boiler where the process starts all over again.

In the process of absorption taking place within the absorber, heat is given off by the ammonia, and to absorb this heat a secondary system employing methyl chloride has been used. The methyl chloride circuit is an independent one, having its own condenser.

Interest in the new air-cooled box has been the occasion for much desirable publicity, with many leading utilities and dealers taking advantage of the opportunity. General mailing of broadsides to consumers was done by a number of metropolitan gas companies, and various special stunts used.

Among the latter, one of the most unique was the tie-up with the Al G. Barnes circus in its Southern California April performances. Before each show "Babe," the world's tallest elephant, entered the arena with a billboard invitation to patrons of the circus to see the new Electrolux. An accompanying illustration shows C. M. Grow, new business manager of Southern California Gas Co. seated in the howdah on Babe's back, A. L. Spring, California manager for Electrolux Refrigerator Sales, Inc., acting as his mahout, the view being posed by Walter D. Thurber, advertising manager for Southern Counties Gas Co. "Babe," even with the adequate proboscis which she possesses, could not find a moving part in the new air-cooled unit.

"Public Utility Regulation" Is New Work on Regulatory Commissions

"Public Utilities Regulation" by William E. Mosher and Finla G. Crawford has been brought from the press of Harper & Bros. The book is a study of the scope and effectiveness of present methods of regulating public utilities through public service commissions, the subject matter including analysis of control of rates, returns, service standards, corporate organizations and finance, depreciation, valuation, etc., of gas, electric, water, telephone, transportation and holding companies.

The book was prepared under the auspices of the School of Citizenship and Public Affairs of Syracuse University, as a companion to "Electrical Utilities, the Crisis in Public Control" and consists chiefly of an expansion of the chapter in that book dealing with the public service commission.

The volume contains also a bibliography and index of cases and commission decisions.

Banks of Australian Gas Light Co. on Tour of Seven Countries

J. H. Banks, industrial fuel officer of The Australian Gas Light Co., Sydney, N.S.W. Australia, arrived in San Francisco early in April aboard the S. S. Manganui for an 8-months trip through the important cities in the United States and Canada, England, Scotland, Germany, France and Holland. He will return to his homeland via the Suez Canal. While in the United States, Mr. Banks will study American gas practice.

L. J. Mueller Furnace Co. Moves Milwaukee Offices

The general offices of the L. J. Mueller Furnace Co., Milwaukee, Wis., maintained for 76 years at the same location at which the business was founded in 1857, will be moved on or about May 1 to newly built offices at the company's plant, at 2005 W. Oklahoma Ave., Milwaukee.

Installing Odorizing Equipment

Odorizing equipment is being installed in th Nebraska systems of the Peoples Natural Gas Co., headquartered at Omaha, Neb.

MEASUREMENT and CONTROL

TABLE NO. 1

Curve No.	410	420	430	440	450	460	470	480	490	500
0	1.0246	1.0252	1.0258	1.0264	1.0270	1.0276	1.0282	1.0288	1.0294	1.0300
1	1.0254	1.0260	1.0267	1.0273	1.0279	1.0285	1.0291	1.0298	1.0304	1.0310
2	1.0262	1.0269	1.0275	1.0282	1.0288	1.0294	1.0301	1.0307	1.0314	1.0320
3	1.0271	1.0277	1.0284	1.0290	1.0297	1.0304	1.0310	1.0317	1.0323	1.0330
4	1.0279	1.0286	1.0292	1.0299	1.0306	1.0313	1.0320	1.0326	1.0333	1.0340
5	1.0287	1.0294	1.0301	1.0308	1.0315	1.0322	1.0329	1.0336	1.0343	1.0350
6	1.0295	1.0302	1.0310	1.0317	1.0324	1.0331	1.0338	1.0346	1.0353	1.0360
7	1.0303	1.0311	1.0318	1.0326	1.0333	1.0340	1.0348	1.0355	1.0363	1.0370
8	1.0312	1.0319	1.0327	1.0334	1.0342	1.0350	1.0357	1.0365	1.0372	1.0380
9	1.0320	1.0328	1.0335	1.0343	1.0351	1.0359	1.0367	1.0374	1.0382	1.0390
10	1.0328	1.0336	1.0344	1.0352	1.0360	1.0368	1.0376	1.0384	1.0392	1.0400
11	1.0336	1.0344	1.0353	1.0361	1.0369	1.0377	1.0385	1.0394	1.0402	1.0410
12	1.0344	1.0353	1.0361	1.0370	1.0378	1.0386	1.0395	1.0403	1.0412	1.0420
13	1.0353	1.0361	1.0370	1.0378	1.0387	1.0396	1.0404	1.0413	1.0421	1.0430
14	1.0361	1.0370	1.0378	1.0387	1.0396	1.0405	1.0414	1.0422	1.0431	1.0440
15	1.0369	1.0378	1.0387	1.0396	1.0405	1.0414	1.0423	1.0432	1.0441	1.0450
16	1.0377	1.0386	1.0396	1.0405	1.0414	1.0423	1.0432	1.0442	1.0451	1.0460
17	1.0385	1.0395	1.0404	1.0414	1.0423	1.0432	1.0442	1.0451	1.0461	1.0470
18	1.0394	1.0403	1.0413	1.0422	1.0432	1.0442	1.0451	1.0461	1.0470	1.0480
19	1.0402	1.0412	1.0421	1.0431	1.0441	1.0451	1.0461	1.0470	1.0480	1.0490
20	1.0410	1.0420	1.0430	1.0440	1.0450	1.0460	1.0470	1.0480	1.0490	1.0500

	310	320	330	340	350	360	370	380	390	400
0	1.0186	1.0192	1.0198	1.0204	1.0210	1.0216	1.0222	1.0228	1.0234	1.0240
1	1.0192	1.0198	1.0204	1.0211	1.0217	1.0223	1.0229	1.0235	1.0242	1.0248
2	1.0198	1.0204	1.0211	1.0217	1.0224	1.0230	1.0236	1.0243	1.0249	1.0256
3	1.0205	1.0212	1.0218	1.0225	1.0231	1.0238	1.0245	1.0251	1.0258	1.0264
4	1.0211	1.0218	1.0225	1.0231	1.0238	1.0245	1.0252	1.0259	1.0265	1.0272
5	1.0217	1.0224	1.0231	1.0238	1.0245	1.0252	1.0259	1.0266	1.0273	1.0280
6	1.0223	1.0230	1.0237	1.0245	1.0252	1.0259	1.0266	1.0273	1.0280	1.0288
7	1.0229	1.0236	1.0244	1.0251	1.0259	1.0266	1.0273	1.0281	1.0288	1.0296
8	1.0236	1.0244	1.0251	1.0259	1.0266	1.0274	1.0281	1.0289	1.0297	1.0304
9	1.0242	1.0250	1.0258	1.0265	1.0273	1.0281	1.0289	1.0297	1.0305	1.0312
10	1.0248	1.0256	1.0264	1.0272	1.0280	1.0288	1.0296	1.0304	1.0312	1.0320
11	1.0254	1.0262	1.0270	1.0279	1.0287	1.0295	1.0303	1.0311	1.0320	1.0328
12	1.0260	1.0268	1.0277	1.0285	1.0294	1.0302	1.0310	1.0319	1.0327	1.0336
13	1.0267	1.0276	1.0284	1.0293	1.0301	1.0310	1.0319	1.0327	1.0336	1.0344
14	1.0273	1.0282	1.0291	1.0299	1.0308	1.0317	1.0326	1.0335	1.0343	1.0352
15	1.0279	1.0288	1.0297	1.0306	1.0315	1.0324	1.0333	1.0342	1.0351	1.0360
16	1.0285	1.0294	1.0303	1.0313	1.0322	1.0331	1.0340	1.0349	1.0359	1.0368
17	1.0291	1.0300	1.0310	1.0319	1.0329	1.0338	1.0347	1.0357	1.0366	1.0376
18	1.0298	1.0308	1.0317	1.0327	1.0336	1.0346	1.0356	1.0365	1.0375	1.0384
19	1.0304	1.0314	1.0324	1.0333	1.0343	1.0353	1.0363	1.0373	1.0382	1.0392
20	1.0310	1.0320	1.0330	1.0340	1.0350	1.0360	1.0370	1.0380	1.0390	1.0400

	210	220	230	240	250	260	270	280	290	300
0	1.0126	1.0132	1.0138	1.0144	1.0150	1.0156	1.0162	1.0168	1.0174	1.0180
1	1.0130	1.0136	1.0142	1.0149	1.0155	1.0161	1.0167	1.0173	1.0180	1.0186
2	1.0134	1.0140	1.0147	1.0153	1.0160	1.0166	1.0172	1.0179	1.0185	1.0192
3	1.0139	1.0146	1.0152	1.0159	1.0165	1.0172	1.0179	1.0185	1.0192	1.0198
4	1.0143	1.0150	1.0157	1.0163	1.0170	1.0177	1.0184	1.0191	1.0197	1.0204
5	1.0147	1.0154	1.0161	1.0168	1.0175	1.0182	1.0189	1.0196	1.0203	1.0210
6	1.0151	1.0158	1.0165	1.0173	1.0180	1.0187	1.0194	1.0201	1.0209	1.0216
7	1.0155	1.0162	1.0170	1.0177	1.0185	1.0192	1.0199	1.0207	1.0214	1.0222
8	1.0160	1.0168	1.0175	1.0183	1.0190	1.0198	1.0206	1.0213	1.0221	1.0228
9	1.0164	1.0172	1.0180	1.0187	1.0195	1.0203	1.0210	1.0219	1.0226	1.0234
10	1.0168	1.0176	1.0184	1.0192	1.0200	1.0208	1.0216	1.0224	1.0232	1.0240
11	1.0172	1.0180	1.0188	1.0197	1.0205	1.0213	1.0221	1.0229	1.0238	1.0246
12	1.0176	1.0184	1.0193	1.0201	1.0210	1.0218	1.0226	1.0235	1.0243	1.0252
13	1.0181	1.0190	1.0198	1.0217	1.0215	1.0224	1.0233	1.0241	1.0250	1.0258
14	1.0185	1.0194	1.0203	1.0211	1.0220	1.0229	1.0238	1.0247	1.0255	1.0264
15	1.0189	1.0198	1.0207	1.0216	1.0225	1.0234	1.0243	1.0252	1.0261	1.0270
16	1.0193	1.0202	1.0211	1.0221	1.0230	1.0239	1.0248	1.0257	1.0267	1.0276
17	1.0197	1.0206	1.0216	1.0225	1.0235	1.0244	1.0253	1.0263	1.0272	1.0282
18	1.0202	1.0212	1.0221	1.0231	1.0240	1.0250	1.0260	1.0269	1.0279	1.0288
19	1.0206	1.0216	1.0226	1.0235	1.0245	1.0255	1.0265	1.0275	1.0284	1.0294
20	1.0210	1.0220	1.0230	1.0240	1.0250	1.0260	1.0270	1.0280	1.0290	1.0300

	110	120	130	140	150	160	170	180	190	200
0	1.0066	1.0072	1.0078	1.0084	1.0090	1.0096	1.0102	1.0108	1.0114	1.0120
1	1.0068	1.0074	1.0080	1.0087	1.0093	1.0099	1.0105	1.0114	1.0118	1.0124
2	1.0070	1.0076	1.0083	1.0089	1.0096	1.0102	1.0108	1.0115	1.0121	1.0128
3	1.0073	1.0080	1.0086	1.0093	1.0099	1.0106	1.0113	1.0119	1.0126	1.0132
4	1.0075	1.0082	1.0087	1.0095	1.0102	1.0109	1.0116	1.0123	1.0129	1.0136
5	1.0077	1.0084	1.0091	1.0098	1.0105	1.0112	1.0119	1.0126	1.0133	1.0140
6	1.0079	1.0086	1.0093	1.0101	1.0108	1.0115	1.0122	1.0129	1.0137	1.0144
7	1.0081	1.0088	1.0096	1.0103	1.0111	1.0118	1.0125	1.0133	1.0140	1.0148
8	1.0084	1.0092	1.0099	1.0107	1.0114	1.0122	1.0130	1.0137	1.0145	1.0152
9	1.0086	1.0094	1.0102	1.0109	1.0117	1.0125	1.0133	1.0141	1.0148	1.0156
10	1.0088	1.0096	1.0104	1.0112	1.0120	1.0128	1.0136	1.0144	1.0152	1.0160
11	1.0090	1.0098	1.0106	1.0115	1.0123	1.0130	1.0139	1.0147	1.0156	1.0164
12	1.0092	1.0100	1.0109	1.0117	1.0126	1.0134	1.0142	1.0151	1.0159	1.0168
13	1.0095	1.0104	1.0112	1.0121	1.0129	1.0138	1.0147	1.0155	1.0164	1.0172
14	1.0097	1.0106	1.0115	1.0123	1.0132	1.0141	1.0150	1.0159	1.0167	1.0176
15	1.0099	1.0108	1.0117	1.0126	1.0135	1.0144	1.0153	1.0162	1.0171	1.0180
16	1.0101	1.0110	1.0119	1.0129	1.0138	1.0147	1.0156	1.0165	1.0175	1.0184
17	1.0103	1.0112	1.0122	1.0131	1.0141	1.0150	1.0159	1.0169	1.0178	1.0188
18	1.0106	1.0116	1.0125	1.0135	1.0144	1.0154	1.0164	1.0173	1.0183	1.0192
19	1.0108	1.0118	1.0128	1.0137	1.0147	1.0157	1.0167	1.0177	1.0186	1.0196
20	1.0110	1.0120	1.0130	1.0140	1.0150	1.0160	1.0170	1.0180	1.0190	1.0200

A Standard Deviation Table

By B. G. WILLIAMS
Southern California Gas Company
and G. B. REECE
*Southern Counties Gas Company**

THE deviation of natural gas from Boyle's Law is generally recognized among those connected with the industry.

The factors are obtained by making tests of the gas and the results are plotted on

B. G. Williams

G. B. Reece

cross-section paper. A separate curve is usually required for each change of 10 degrees in temperature.

For a certain gas, we then have a set of deviation curves which cover the temperature range. A sample set of these curves is shown in Fig. 1.

The purpose of this paper is to prepare a set of standard deviation curves and then to prepare a standard deviation table from the readings on the standard curves. Then when tests are made and the curves plotted, each curve may be given a standard number by referring it to the standard curve which nearest resembles it for the desired condition. In this manner, each deviation curve is given a definite location.

A set of standard deviation curves is shown in Fig. 2. These curves have been prepared to cover the range found in the usual operating practice. For 500 pounds pressure, Curves No. 0, No. 1, No. 2 . . . . etc., have a deviation factor of 1.0300, 1.0310, 1.0320 . . . . etc.

A standard deviation table has been prepared from the standard deviation curves. (See Table No. 1).

Practically all deviation curves may be given standard curve numbers from this table. For example: In Fig. 1, the curve for 120 degrees F. for a pressure of 450 pounds, the deviation factor is 1.0315. Then

*Presented before the Southern California Meter Association, March 23, 1933.

on the standard deviation table for 450 pounds pressure, the factor 1.0315 is shown to be on Curve No. 5. Therefore, this curve may be called Standard Curve No. 5, and the table for Curve No. 5 may be used instead of this curve. In like manner, all the other curves may be given standard deviation numbers.

In practice the one who makes the deviation tests should find the standard curve for each temperature and report his tests according to standard curve numbers. By using this plan, the greatest error obtainable for 500 pounds pressure would be .0005, and this lessens as the pressure is decreased.

In some instances, there appears to be a tendency for deviation curves to bend slightly downward for high temperatures and slightly upward for low temperatures. Where this condition is found, the deviation curves should be compared with the standard table at the operating pressures.

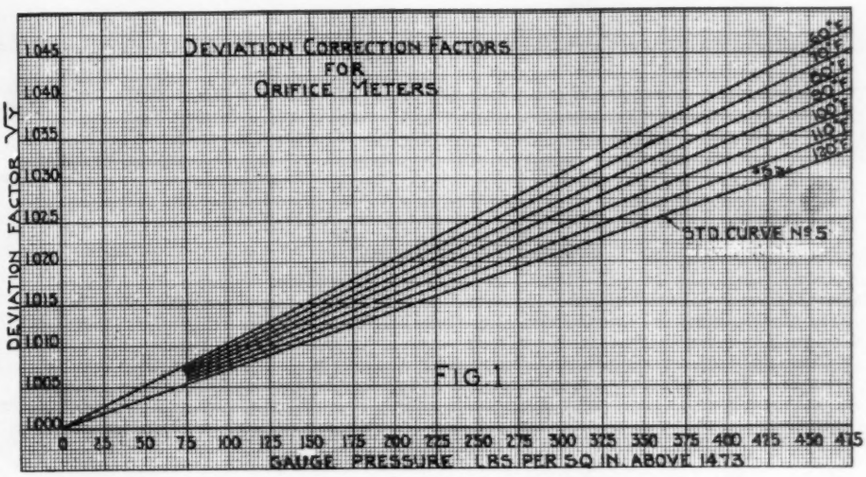


Fig. 1.

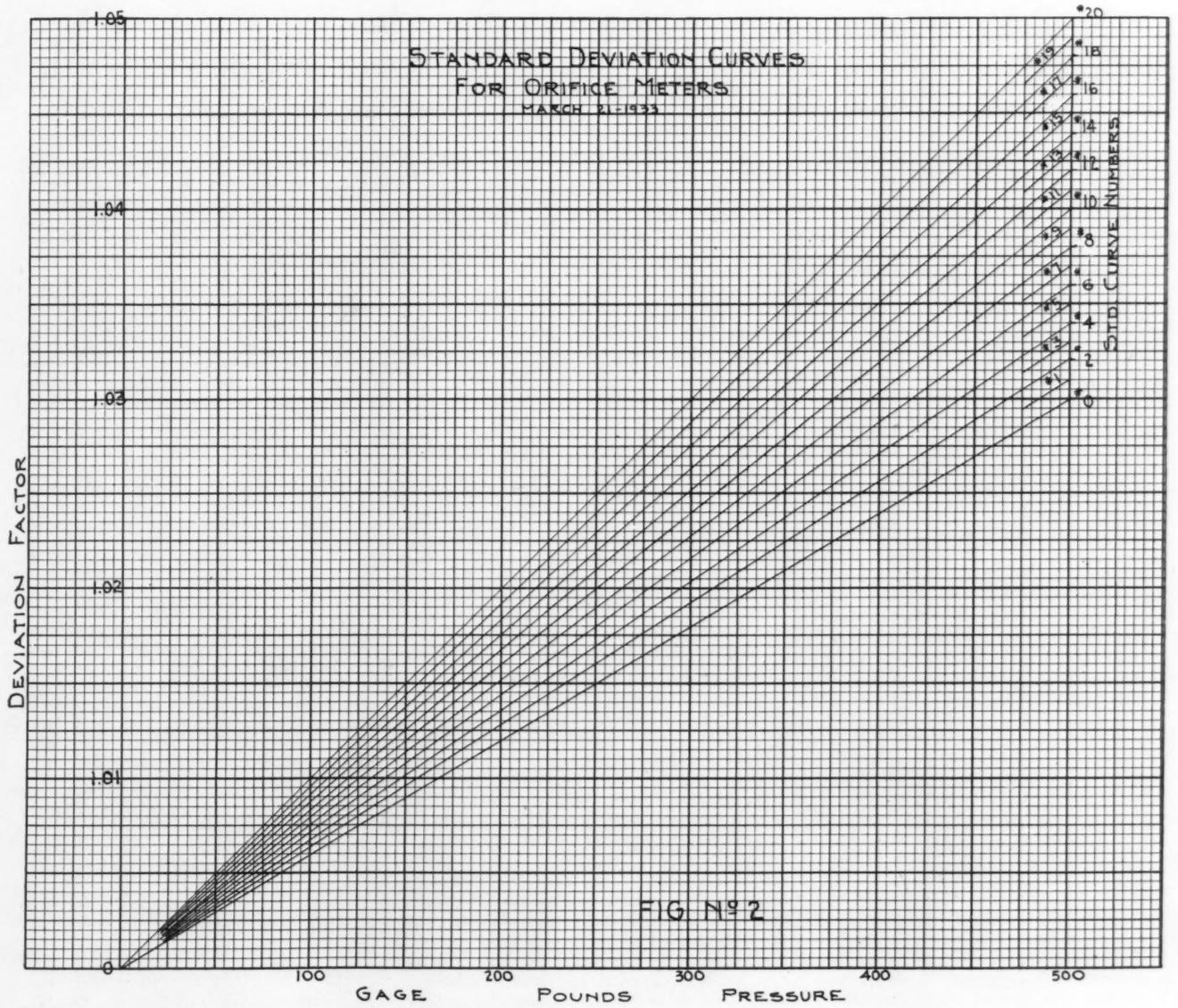


Fig. 2.

Southern California Meter Association Activities

MEETING again at Taix French Restaurant, Los Angeles, members of the Southern California Meter Association on April 27 heard an interesting business program. W. A. Cox of the Los Angeles Gas and Electric Corp. gave a paper on "Construction and Operation of Positive Gas Meters", with slides and cut-a-way models to illustrate the principles of design. E. S. Fuller of the Binckley laboratories discussed "Field Methods Employed in the Determination of Specific Gravities of Gases", exhibiting a new type portable gravitometer. Forty-eight members were present at the meeting.

Pulsation Research: President L. P. W. Des Brisay has announced the appointment of a Committee on Pulsating Gas Flow, with T. K. M. Smith of the Industrial Fuel Supply Co. as chairman. The committee will install a test set-up and carry on a program of experimentation. Members, in addition to Mr. Smith, are F. W. Curtis, Shell Co.; M. J. Cereghino, Los Angeles Gas and Electric Corp.; F. A. Hough, Southern Counties Gas Co.; B. G. Williams, Southern California Gas Co.; Edgar Valby, Richfield Oil Co.; R. F. Angell, Union Oil Co.; C. B. Heartwell, Standard Gasoline Co.

Tennis: On May 7 tennis-playing members of the S.C.M.A. will hold a tournament at Exposition Park, Los Angeles, where two courts have been reserved from early morning on. Play will start at 9 a.m. B. G. Williams and M. J. Cereghino are in charge of the arrangements.

Jubilee Golf Tourney: The Third Annual Jubilee Golf Tournament, held at Rio Hondo Country Club on Saturday afternoon, April 29, was a very successful affair in spite of threatening weather. Eight foursomes teed off, including the winners of the past 12 monthly tournaments. Chas. J. Warren of the Chanslor Canfield Midway Oil Co. was the heavy winner of the day with a gross of 84. As winner of low net Mr. Warren has permanent possession of S.C.M.A.-*Western Gas* Goodfellowship Trophy. (Another trophy, incidentally, has been placed in competition for the current year of S.C.M.A. golf). A set of club boots, and a carry-all bag went to Mr. Warren for low gross and low net, respectively.

Another multiple winner was Elting Henderson of the Southern California Gas Co. who took the prize for low gross on short holes (a shoe bag) and for the longest drive off the first tee (a zipper vest).

Harry C. Dahl, Geo. Christen, H. G. Miller, and W. Hendrix split the prize for the flag tournament (golf balls).

Arrangements for the tournament were handled by a committee headed by A. E. DeBurn of Southwest Welding and Mfg. Co., with the assistance of T. K. M. Smith, Ralph Cook, and G. H. Finley.

Review of 1932-1933 Transmission Line Construction

(Continued from Page 11)

show sufficient consumer demand to warrant it. Among these are to be numbered chiefly Northern Gas and Pipe Line Co.; Natural Gas Pipeline Co. of America and Panhandle Eastern Pipe Line Co.

Northern Gas and Pipe Line Co. added Forest City, Eagle Grove and Clarion, Iowa, as natural gas users through construction of lateral lines, while 28 miles of line were added by that company in Nebraska to serve Schuyler and Columbus, the latter city being changed over from manufactured to natural by Central West Public Service Co., headquartered at Omaha. This company also constructed 16 miles of 18- and 16-inch line in Nebraska, from Plattsmouth to serve packing houses in South Omaha.

Northern Gas and Pipe Line Co. and its affiliate, Minnesota Northern Natural Gas Co., in 1932 completed construction of 22 miles of 8-inch carrier, taking natural to Austin, Minn., and shorter laterals to Awatonna, Albert Lea and Waseca.

Reports from the southwest Minnesota area indicate that market surveys are now being made by Minnesota Northern Natural Gas Co. in Luverne, Worthington, Jackson, Windom, James, Fairmont and Mankato, with the object of ascertaining the advisability of construction of a line from Sioux Falls, S. D., to join the main line at a point near Owatonna. The new carrier would be approximately 175 miles long.

This company is also credited with aiming at the Twin Cities market, Minneapolis having 107,803 meters and St. Paul 69,031, now on manufactured gas service. The line now terminating near Owatonna would need to be extended about 65 miles to include this market.

The Minneapolis-St. Paul market is also a tempting one for Montana operators, with several reports current that application is now before the Reconstruction Finance Corp. for funds necessary to construct a 500-mile large-diameter line to serve that area and also pick up domestic load in towns and cities along its route, which would extend from Montana fields across North Dakota and Minnesota.

Natural Gas Pipeline Co.'s Plans

Natural Gas Pipeline Co. of America in its 1932 extension program brought natural gas service to Muscatine, Pella, and Creston, Iowa, as well as supplying gas for the Red Oak-Shenandoah 28-mile carrier built by Iowa-Nebraska Light & Power Co. Natural Gas Pipeline Co. also has under way at this time construction of a line to serve Davenport, Iowa, where Peoples Light Co. serves manufactured gas through 16,426 meters.

Rights of way are now being secured by the company along the proposed route of the Oskaloosa-Waterloo carrier, present plans indicating that the line will extend north to Marshalltown and then northeast to Waterloo. This line would be approximately 80 miles long, of 8-inch pipe.

Plans for serving Cedar Rapids from the company's main line are also maturing at a rapid rate, this line as now projected to extend to Iowa City and thence to Cedar Rapids.

Market surveys are being run by Natural Gas Pipeline Co. of America in Chariton, Albia, Centerville, Ottumwa, Fairfield, Burlington, Ft. Madison, Keokuk and several other towns, with permission already obtained from the Iowa commission to serve natural gas in these communities. According to a sketch map supplied to *Western Gas* by the company's engineering staff, the route of one of the proposed lines would take it to Chariton, a distance of about 15 miles, another would extend to Centerville, with laterals to Albia and Fairfield, requiring about 100 miles of construction, while a third would almost parallel the Iowa-Illinois state line for 75 miles to Burlington, Ft. Madison and Keokuk.

Wisconsin Scheduled for Natural

Plans of this company to extend natural gas service from the Texas-Chicago carrier to communities in northwestern Illinois and Wisconsin are still in the wind, with a line scheduled to leave the main line at a point near the Geneseo compressor station extending in a northeasterly direction across the Illinois state line into Wisconsin and on to Milwaukee and adding Wisconsin as a new natural gas state. A lateral would tap this extension, taking service to Madison, Wis., under present plans, while a further extension would be made almost directly north to manufacturing communities in northern Wisconsin, including Green Bay, Fond du Lac and Sheboygan, where market surveys are being made. Lines to reach these communities would call for the laying of more than 200 miles of large diameter pipe.

Galesburg, Ill., south of the main line is also scheduled for natural gas service if the offers now being made by Natural Gas Pipeline Co. of America is to supply that city are accepted by the Illinois Power & Light Corp., distributing manufactured gas there. This line would be approximately 30 miles long. Another district in which market surveys are being made by this company lies between Clinton and Dubuque, Iowa, plans calling for construction of a lateral from the proposed Geneseo-Milwaukee extension to serve these two cities, the line to be about 75 miles long.

In 1932 the Illinois Northern Utilities Co., headquartered in Dixon, Ill., carried on an active construction program, completing a line for taking manufactured gas from its plant at Dixon to Polo, Mt. Morris and Oregon, this line to be changed over to natural gas service on completion of connections with the proposed Geneseo-Milwaukee line of Natural Gas Pipe Line Co.

Panhandle Eastern's Added Territory

Panhandle Eastern Pipe Line Co. of Kansas City, Mo., and its affiliate, Panhandle Illinois Pipe Line Co. completed approximately 25 miles of new gas line to Quincy, Ill., where Central Illinois Public Service

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HUGH CUTHRELL
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1111A
UP TO APRIL TWELFTH SOLD SIXTY-TWO AIR-COOLED ELECTROLUX STOP PUBLIC IS SWARMING INTO SHOWROOM
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NEW HAVEN GAS LIGHT CO.
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FROM Philadelphia . . . New Haven . . . Brooklyn . . . Pittsburgh . . . and other key cities comes the word: The New Air-Cooled Electrolux has *caught on* like wildfire! Sales are skyrocketing. Showrooms are crowded day and (often far into the) night. Never before has *any* gas appliance so quickly appealed to the public's imagination and pocketbook.

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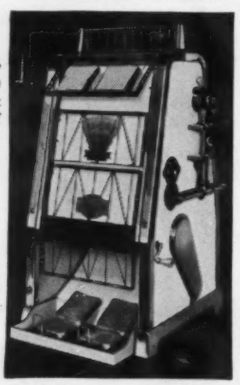
NEW *Air-Cooled* ELECTROLUX THE *Gas* REFRIGERATOR

GAS TRANSMISSION LINE CONSTRUCTION 1932-1933

(Continued from Page 11)

Company	Line Location	Length (Miles)	Size (Inches)	Status; Cost
WYOMING				
Rocky Mountain Gas Co.	Dutton Creek to Laramie (reconditioned oil line)	30 6	6 8	Completed, 1933
Rocky Mountain Gas Co.	Allen Lake Structure to Dutton Creek-Laramie line	22	8	Proposed
BRITISH COLUMBIA				
British Columbia Electric Railway Co., Ltd.	Victoria to city limits	4.4	4,3 1½	In progress Cost, $17,997
British Columbia Electric Railway Co., Ltd.	Victoria to Oak Bay	10.4	2, 1½	In progress Cost, $28,502
British Columbia Electric Railway Co., Ltd.	Victoria to Saanich	5.8	3, 2, 1½	In progress Cost, $19,007
British Columbia Electric Railway Co., Ltd.	Victoria to Esquimalt	7.2	2, 1½	In progress Cost, $21,120
ALBERTA				
Northwestern Utilities, Ltd.	Ryley, two miles west	2	12¾	Completed, 1932 Cost, $24,000
MEXICO				
Compania Mexicana de Gas, S. A.	Monterrey-Roma main line to Potrero de "La Alberca"	5.1	8	Completed, 1932 Cost, $50,000



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TOASTERS

Co. now serves natural as a result of this line completion. Panhandle also completed a lateral from its main 24-inch line to serve Taylorville and other towns in that vicinity, served by Central Illinois Public Service Co.

Another important development in the Illinois district was the reconditioning of 80 miles of gas pipe line extending from Terre Haute, Ind., to Paris, Ill., which was constructed by Indiana Consumers Gas and By-Products Co. in 1929. This line had been extended in 1930 and 1931 to serve manufactured gas in Ashmore, Kansas, Charleston, Mattoon, Neoga, Sigel and Effingham, Ill. During August, 1932, change-over to natural gas was made, supply coming through the Terre Haute line from the Missouri-Kansas Pipe Line Co.'s source of supply in Kentucky.

The state of Michigan has shown much activity during 1932 with a new field in Central Michigan bringing additional possibilities for adequate commercial gas supplies. Cities named in petitions before the Michigan public utilities commission as being in line for natural gas service in the not-too-far distant future include Saginaw, Bay City, Flint, and Pontiac. Consumers Power Co. and the Michigan Natural Gas Corp. of Lansing are mentioned as being interested in bringing this program to a head.

Availability of natural gas in greater quantities from the Tioga field in northwestern Pennsylvania and southwestern New York gave new aspects to natural gas service in nearby sections of the eastern seaboard, with Lycoming Natural Gas Co. and New York Natural Gas Co. conducting major line construction programs, bringing change-overs in Syracuse, Onadaga and several other cities and towns served by Syracuse Lighting Co. In addition, the development program of Columbia Gas & Electric Co. was furthered, with present indications that Philadelphia and possibly other major population centers soon may be linked into Columbia's network.

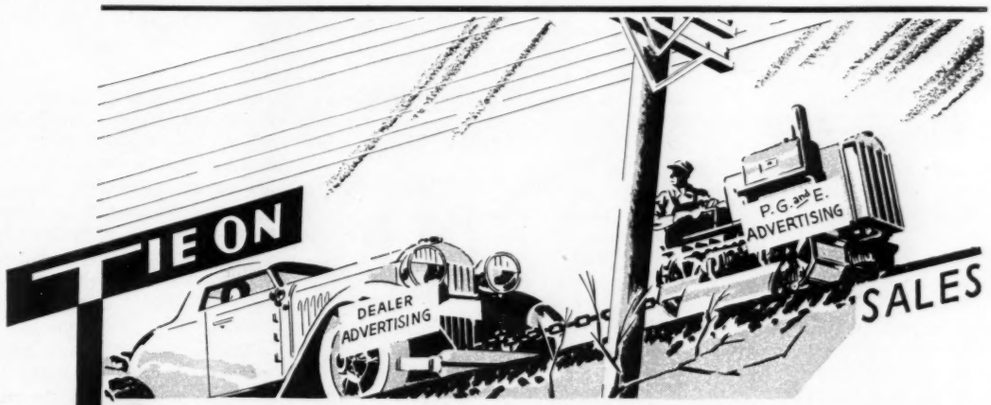
New Gas Towns, 1932-33

(Continued from Page 20)

Company Town	Population	Meters
Quincy	39,241	9,792
Kansas	900	
Ashmore	431	67
Pana	5,835	
Tower Hill	642	917
Effingham	4,978	
Sigel	259	201
Public Service Company of Northern Illinois		
Marseilles	4,292	893
Kankakee	20,620	5,718
Bradley	3,048	163
Streator	14,728	3,412
Ottawa	15,094	3,512
IOWA		
Iowa Public Service Co.		
Eagle Grove	4,071	731
Iowa Electric Company		
Atlantic	5,585	748
Muscatine	16,778	2,655
Iowa-Nebraska Light and Power Co.		
Red Oak	5,778	1,119
Shenandoah	6,502	948
Sioux City Gas & Electric Co.		
Sioux City	79,183	18,369
Central States Electric Co.		
Knoxville	4,697	493
Pella	3,326	231
MINNESOTA		
Minnesota Northern Natural Gas Co.		
Austin	12,276	2,498
Albert Lea	10,169	1,903
Waseca	3,815	437
Owatonna	7,654	1,414
Rochester	20,621	3,107
MISSOURI		
Laclede Gas Light Co.		
St. Louis	821,960	195,605
Missouri Power and Light Co.		
Excelsior Springs	4,565	836
Mexico	8,290	709
The St. Louis County Gas Co.		
Brentwood	2,988	
Clayton	10,180	
Deer Creek Village	497	
Ferguson	4,026	
Glendale	1,532	
Huntleigh Village	84	
Kirkwood	9,710	
Ladue Village	826	
Maplewood	13,420	
McKnight Village	437	38,510
Oakland Village	467	
Olivette	212	
Richmond Heights	9,700	
Rockhill Village	1,387	
Shrewsbury	1,615	
University City	27,350	
Webster Groves	17,460	
Unincorporated Territory in St. Louis County	81,700	
NEBRASKA		
Central West Public Service Co.		
Columbus	5,410	1,264
WYOMING		
Rocky Mountain Gas Co.		
Laramie	8,600	438

APPLIANCE DEALERS!

A SURE WAY TO MAKE THIS GRADE



TO P·G·and E· ADVERTISING

To make your advertising effective—GET YOUR MESSAGES READ by coupling them to this sustained, year 'round campaign of attention-compelling advertisements. P. G. and E. advertising and publicity is squarely behind you in your efforts to maintain business on a QUALITY and PROFIT basis. It is constantly educating people to the *real economy* of QUALITY APPLIANCES—their long life, dependability, and low operating cost. Don't waste the tremendous force of this advertising—custom-built to sell good merchandise *through dealers*. All P. G. and E. advertisements carry an invitation to "see your local dealer." Identify YOUR store as the place to BUY these modern miracles of cooking and heating efficiency. The P. G. and E. story is YOUR story because it is creating a desire for the things you have to sell. To capitalize on it you *must* let its readers know WHERE these appliances may be purchased. Regular tie-in advertisements will mean more advertisements per dollar and MORE SALES PER ADVERTISEMENT. TIE ON NOW!

P·G·and E·
PACIFIC GAS AND ELECTRIC COMPANY
Owned · Operated · Managed by Californians

WG 205-533

7 FACTS

THAT PROVE THE PULLING POWER OF DEALER TIE-IN ADVERTISING

1. The SELLING POWER of local dealer advertising when tied in with P. G. and E. campaigns has been *proved*. The total amount has increased more than 50% since August, 1932.
2. P. G. and E. advertising is continuous, yet seasonal in copy appeal. It is based on a first hand knowledge of retail conditions and is perfectly adaptable to your current sales program.
3. These advertisements constantly stress the *real economy* of QUALITY appliances and the false economy of fuel-eating, undependable, and short lived "bargain" appliances.
4. All P. G. and E. advertising and publicity is squarely behind the substantial, independent dealers who are striving to maintain high standards of quality and fair prices.
5. P. G. and E. advertisements promote the sale of *major* appliances. The higher margin of profit on these products warrants *regular* newspaper advertising.
6. Dealer advertisements tied in with P. G. and E. copy are NEVER BURIED. On the other hand, the dealer receives attention-value far in excess of the purchased space.
7. The size and regularity of this year 'round campaign makes it an ideal foundation for a planned, systematic schedule on a fixed yearly budget.

Natural Gas for Dehydrator Fuel

(Continued from Page 13)

lined with fire brick. The gas or oil burners fire into this brick-lined combustion chamber and from it the products of combustion are taken through sheet iron pipes which pass back and forth so that a large surface of metal is exposed to the air being heated. These flues are usually designated as the radiators and they, together with the combustion chamber, are inclosed in a brick setting so that the air which is taken in near the surface of the ground, rises past the radiators a distance of about 12 feet to the floor of the dryer or the lower of the trays if trays are being used. Above the drying floor or the trays is a tongue and groove stack which creates a draft and pulls the air up through the apples being dried. The whole affair is very simple and comparatively inexpensive in construction.

The preparation of the apples for drying consists of peeling, coring, and slicing or quartering the apples. The majority of this handling of the apples is done by hand labor, although some plants are equipped with automatic machinery. Many of the apples are quartered, particularly for the foreign market, and usually the quartered apples bring a premium of about one-half cent a pound. The peeled and sliced apples are exposed to sulphur fumes to prevent the darkening of the fruit while being dried. Usually about 20 hours is required in drying a floor of apples but this will vary somewhat, depending upon whether the fruit is early in the season and contains a high percentage of moisture or whether the fruit is quite ripe and the amount of water to be evaporated is low. Early apples and immature fruit often necessitate the evaporation of 90 per cent of the weight of the green apple in the form of water.

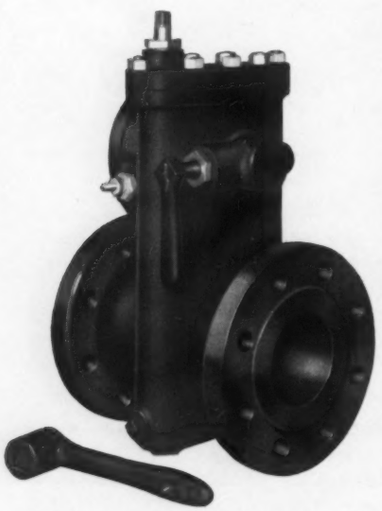
The floor type dryers have an exposed surface of about 400 square feet and will produce about one ton of dry apples per 20 hours. The tray type dryers, with approximately 150 3 x 3 trays, have just a slightly lesser capacity.

In view of the fact that the dryers are heated indirectly, the advantage of gas as a fuel is dependent almost entirely upon ease of control and flexibility. One operator stated that the saving of time in attending the burner amounts to only one and one half hours a day and inasmuch as fuel oil was being purchased by tank car, little or no premium could be paid for gas as a fuel. Last year the price of dried apples fluctuated between 3½c to 6c per pound and it is obvious that it would take but little change in the cost of fuel used in drying to make the difference in whether a crop was profitable or whether the grower sustained a loss.

The same factors of ease of control and cleanliness are about the only factors which have influence in determining whether gas or fuel oil is used in drying other products than apples. A user who is paying $200 or $300 a season for fuel in his drying operations is willing to pay a premium of possibly $30 to $40 for gas but balks at paying 50 per cent or more for gas in place of fuel oil.

Raisins, prunes, peaches, apricots and pears are largely dried in tunnel dryers, which consist of heating elements similar to those used in the stack apple dryers, which are so arranged that large multivane fans blow the air over the radiator and through tunnels which are occupied by cars containing trays of the fruit being dried. The air is recirculated and a portion of the moist air discharged to the atmosphere and fresh air constantly taken in.

There are differences of opinion as to whether the fruit progressing through the tunnel should enter at the point of the hottest and dryest air or whether it should enter at the point where the moisture laden air again enters the heating chamber. There are arguments in favor of both of these two methods.



Flange end view from the inspection side. Note the elliptical body design of the entire fitting which increases the strength yet reduces its weight. The orifice disc is in line position, positively centered and locked. Discs are interchangeable.

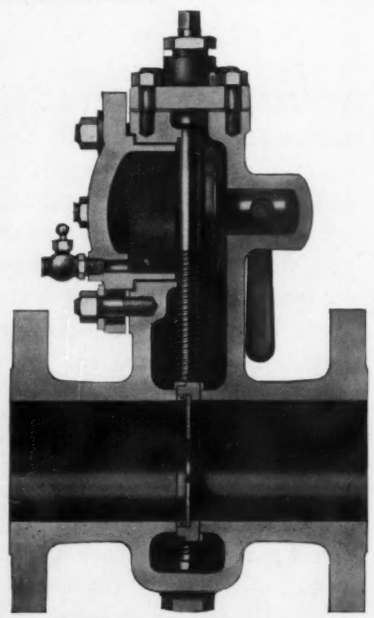
... The *New*
LUCAS ORIFICE FITTINGS
are Simplest in CONSTRUCTION, INSTALLATION and OPERATION

IN CONSTRUCTION—Compact elliptical body design; no rib-reinforcing; 10% to 40% lighter in weight; all working parts stainless; positive centering of orifice plate, concentric with axis of pipe.

IN INSTALLATION—Any angle installation permissible; occupies smaller space due to non-rising elevator stem requiring no head room; flow through orifice may be in either direction.

IN OPERATION—Plate removed through side of fitting; orifice disc is standard, interchangeable with others; total time for changing need not be over 5 minutes.

Write for a new circular describing the orifice fitting in detail.



Cutaway view of fitting.

SOUTHWEST WELDING AND MANUFACTURING CO. INC.
• • ALHAMBRA CALIFORNIA • •
TWENTY-FIVE YEARS OF WELDING EXPERIENCE

The successful operation of a tunnel dryer presents a problem which is difficult of solution. The cars containing the trays of fruits being dried must be so arranged that there is a space between the trays for passage of the air and yet not enough space to permit the air being bypassed or not passing over the fruit. If there is too much space between the trays there is a possibility of only a portion of the fruit being dried and that the fruit is also unevenly dried. On the other hand, if the spaces between the trays are too small a back pressure is set up on the fan and the power costs go up. It is rather well established that the most desirable velocity of air passing over trays is approximately 500 feet per minute.

Other factors, such as the relative humidity and its control, must be considered in the designing of a dehydrator.

While the tunnel dryer usually is more efficient than the stack type dryer, the cost of construction is very materially greater and in addition considerable power is required, which to some extent offsets the saving in fuel cost. Generally speaking, unless a tunnel dryer can be kept in continuous operation throughout the fruit season, it is not an economical proposition from an investment viewpoint. However, if drying can be done on a commercial basis and the dryer kept in continuous operation, the interest charges per ton of fruit dried can be lowered very appreciably.

It is interesting that one large commercial dehydrator operating on prunes had a cost per ton for power of 82c, gas fuel 61c, and interest charges $1.34, the interest on the investment being almost equal to the combined cost of power and gas.

In conclusion, a word might be said about the application of burners to dehydrators, although this represents but a minor problem in selling gas for this purpose. The combustion chamber of the dehydrators, as has been said, is a brick-lined affair and there is no particular attempt to control the amount of excess air used. The stack temperatures are always very low and a difference of 30 or 40 per cent in excess air will make but a very small difference in percentage in the overall efficiency.

Some of the installations that have been made consist merely of a small mixer with a piece of pipe for a burner inserted into the opening at the end of the combustion chamber. In other cases more elaborate installations have been made with multi-jet burners with control of the air used for combustion. A number of operators of dehydrators have disconnected their radiators from their combustion chambers in the dehydrators and are recirculating the products of combustion from the gas fuel, together with the air used for drying. While accurate figures are not available, there is on apparent increase in over-all efficiency and it is probable that during this coming year practically all dehydrators will operate on this basis. If the products of combustion are recirculated, advantage can be taken of a 200 or 300-degree drop in temperature in stack gases and as there are no injurious products in the flue gases, it would seem that their recirculation would be a logical step.

Acknowledgement is made of the courtesies extended by R. E. Oehlman of Graton, A. E.

Eliminate **COLD 70°**

The Low Limit Control System enables your gas burner to deliver full performance by keeping enough heat in radiators and hot air registers to prevent air stratification or "Cold 70°". A low priced control with a ready market. Minneapolis-Honeywell Regulator Company, 401 East 28th Street, Minneapolis, Minn. Branch offices or distributors in all principal cities

MINNEAPOLIS-HONEYWELL
Control Systems

SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
Chester, Pa.

The reason for the long life and low maintenance cost of cast iron pipe is its effective resistance to rust. Cast iron is the one ferrous metal for water and gas mains, and for sewer construction, that will not disintegrate from rust. This characteristic makes cast iron pipe the most practicable for underground mains since rust will not destroy it.

For further information, write to The Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, 309 Peoples Gas Bldg., Chicago, Ill.

CAST IRON PIPE

Look for this **Trademark**

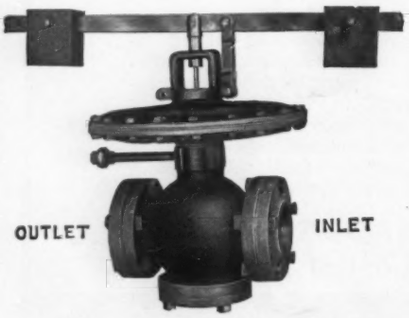
If you would keep in touch with the Natural Gas and Butane industries, send a check for $2.00 to

WESTERN GAS
810 South Spring Street, Los Angeles

Name.....
Company.....
Position Occupied.....
Street Address.....
City and State.....

Subscription Rates: I Year $2.00; 3 years $5.00; Foreign $3.00 per year.

Where Inlet Pressure Is Low



GF

THE Fulton Weighted Illuminating Regulator, designed for either natural or manufactured gas, will reduce from inlet pressure of 40 lbs. or less to any delivery pressure between one ounce and 5 lbs. No stuffing box, practically frictionless, highly sensitive, specially adapted for use where difference between inlet and outlet pressure is very slight. Ask for full information about this regulator or any requirement of pressure control.

The Chaplin-Fulton Manufacturing Company

28-40 Penn Ave. Pittsburgh, Pa.

REPRESENTATIVES
Westcott & Greis, Inc.: Dallas-Tulsa
Jno. W. Crawford, Sales Engineer: Los Angeles
Parsons Engineering Co.: Los Angeles-San Francisco

FULTON Weighted Illuminating Regulator

NO-OX-ID
IRON-RUST
The Original Rust Preventive

Gas Holder Seal

The excellent service reports which have followed the use of NO-OX-ID Gas Holder Seal are attributable to the following superiorities:

1. Supplies both mechanical and chemical protection.
2. Non-drying. No built-up lumps or ridges on lifts.
3. Costs far less than painting.
4. Priming of new holders or removal of paint from old holders unnecessary.
5. Maintenance much less than when paint is used.
6. Practically no labor costs for application.
7. Wire brushing and scraping eliminated. No scaffolds or falls.
8. Additional material needed only to replace mechanical loss.
9. Only infrequent dipping required.
10. Penetrates paint blisters. Removes rusty accumulations.

Worthy of your careful consideration. Recommendations and estimates supplied gladly.

DEARBORN CHEMICAL COMPANY
LOS ANGELES:
807 Mateo Street, Phone TRinity 3385
SAN FRANCISCO
421 Bryant St., Phone SUtter 8688

FRASER
GAS APPLIANCES AND FURNACES

Announcing—

Two New Large Capacity

FLOOR FURNACES

No. 135 —50,500 B. T. U. Input
No. 135A—57,000 B. T. U. Input

The Complete Line now includes
7 sizes Floor Furnaces
11 sizes Basement Furnaces
2 sizes Wall Furnaces
5 sizes Pipeless Furnaces
5 sizes Console Heaters
Baked or Porcelain Enamel

Write for our new catalog and price list.

Manufactured by

Fraser Furnace Company
Stockton, Calif.

Distributed by

H. R. BASFORD CO. San Francisco Los Angeles

Rae of Campbell, and George Chapman of Modesto, Calif., in supplying information on which much of the foregoing has been based.

Wm. F. Weadley, Former Sales Manager for General Gas Light, Dies

WILLIAM F. WEADLEY, formerly general sales manager of General Gas Light Co., Kalamazoo, Mich., passed away at his home in Kalamazoo, April 10, 1933.

Mr. Weadley was born in Chicago, November 11, 1865. His family was of pioneer stock and active in the business life of the early days of that city.

After graduation from Notre Dame College he was for some years associated with his father's business in Chicago, and later entered the employ of the Ogden Gas Co. of Chicago. After the consolidation of that company with the now Peoples Gas Light & Coke Co., he continued his services for a brief period.

In 1907 he joined the General Gas Light Co., going first to the eastern department in New York, traveling New England, the central Atlantic states and the Southern states, in his capacity of salesman.

In the spring of 1910 he was transferred to the main office at Kalamazoo as general sales manager, a position which he held until his retirement a few years ago.

Gaynor-Ramsay Co. Formed as Electrolux Dealer

Formation of the Gaynor-Ramsay Co., authorized dealer for the Electrolux gas refrigerator with display offices at 723 W. 8th St., Los Angeles, Calif., was announced late in April. Sidney B. Gaynor and Eugene P. Ramsay comprise the firm, Mr. Gaynor having for the past four years been assistant advertising manager for the Southern Counties Gas Co., and Mr. Ramsay for the past 10 years associated with the Los Angeles Gas and Electric Corp. Mr. Ramsay has served as advertising manager for L. A. G. and E. for some years, and has been active in the affairs of the Pacific Coast Gas Association. He was this year's chairman of the Association's Publicity and Advertising Section, resigning that office upon entering private business.

Offices of the new company were opened on May 1. A retail sales organization being built up to engage in outside sales work on the new Electrolux air-cooled models.

Ruth Martin Home Service Director for North Shore Gas Co.

Miss Ruth Martin has been named home Service director of the North Shore Gas Co. Chicago, Ill., to take the place of Mrs. Nina T. Brewer who resigned that post recently.

Applies for Faribault Permit

Minnesota Northern Natural Gas Co. with state headquarters at Rochester, Minn., is reported to have applied for franchise to serve natural gas at Faribault, Minn.

Drachman Appointed Manager San Angelo Division Texas Public Service

ANNOUNCEMENT was made recently of the appointment of Phil Drachman as manager of Texas Public Service Co., San Angelo, Texas, filling the post left vacant by the resignation of E. R. Bradbury.

Phil Drachman

Mr. Drachman entered public utility work with the Tucson Electric Light & Power Co., Tucson, Ariz., subsidiary of Federal Light & Traction Co. in 1925 in the new business department. In 1926 he went with Arizona Power Co., Prescott, Ariz., as commercial manager, where he remained until his removal to New York City as commercial manager with the Peoples Light and Power Corp. His activities with this company consisted of merchandising and new business for the properties of this group, and also of the Southern Natural Gas Corp. at the time the gas line was laid from Louisiana to Atlanta, Ga.

Mr. Drachman in 1932 left the Peoples Light and Power organization for a period of one year during which time he was with the Cities Service organization. On the first of March, 1933, he returned to the Peoples Light and Power as manager of the San Angelo Division of the Texas Public Service Co.

Rom-Ed Syndicate Formed to Supply Gas to Lewistown

The Rom-Ed Syndicate has been formed at Lewistown, Mont., for the purpose of taking natural gas service to Lewistown from the Armells field some 20 miles distant. The Syndicate has taken over leases on several thousand acres in the field, and would use the pipe now on hand, brought into the city in 1931 for a similar project which did not develop.

The gas, in addition to serving the domestic load in Lewistown, would be piped to a large cement plant 7 miles from the city and a plaster mill, still farther away from the city in the opposite direction. The total cost of bringing in the gas and laying the distribution system is estimated at $400,000.

H. Leonard DeKalb is president of the company and J. E. McKenna is secretary.

Guthrie Gas Service Moves to New Headquarters

Headquarters for Guthrie Gas Service Co. Guthrie, Okla., have been moved to 210 E. Oklahoma St., the company occupying its former offices for the past 25 years. The building into which the company moved was entirely remodeled for the purpose.

Gas Tax Bill Killed in Committee

The bill before the Minnesota State Legislature which provided for an assessment of 10 cents per thousand cubic feet on natural gas brought into the state was killed in committee on March 29.

UNIFORM PRESSURE

. . . a result of specifying RELIANCE Type "H" Regulators for House or Service Regulation of Manufactured, Natural or Butane Air Gases.

Type "H"—Weight Loaded Model

Type "H"—Spring Loaded Model

REGULATORS YOU CAN RELY ON — RELIANCE

For detailed information address:

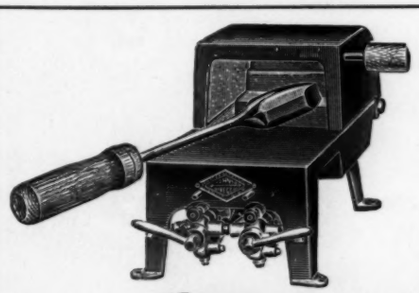
RELIANCE REGULATOR CORPORATION

1000 MERIDIAN AVE., ALHAMBRA, CALIF.

Manufacturers of Gas Regulators for All Purposes

RELIANCE

REGULATORS

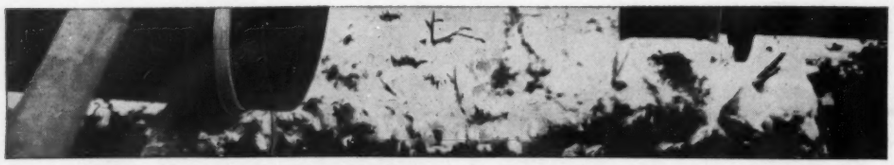


Real Value in This Bench Furnace

The Johnson No. 101 Bench Furnace is one of the most popular units on the market. Heats soldering coppers up to 12 pounds per pair. Ideal for heat-treating small tools and parts. Operates perfectly without forced air blast.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Representative—C. B. BABCOCK CO.
135 Bluxome St., San Francisco, Calif.



Over 10,000,000 In Use

It's safest to specify Paranite
The leading Pipe Joint Gasket

TRADE PARANITE MARK

Sold by Pipe Joint makers

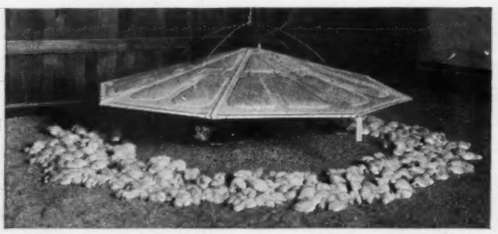
The Manhattan Rubber Mfg. Division
OF RAYBESTOS-MANHATTAN, INC.

Executive Offices and Factories
Passaic, New Jersey

GAS BROODERS

The new type Hart Radiant Gas Brooders are causing a sensation amongst poultrymen. They are proving by far the best means of brooding chicks. Increase your sales of gas by handling this leading line. Hart Gas Brooders will raise a greater percentage of chicks with less labor and expense than any other method. All brooders thermostatically controlled—hang from ceiling—teach chicks to perch—gas pipe runs overhead with flexible gas tubing running to brooder. Get your share of the vast potential fuel load for brooding of chicks and turkeys. One poultryman is worth a dozen ordinary household gas consumers.

Send at once for descriptive literature, discounts, etc.



Flashlight photograph of chicks sleeping under a Hart Gas Brooder at the world's largest poultry ranch where Hart Brooders are used exclusively. One hundred and forty-four brooders in operation the year round brooding five hundred to one thousand chicks to the brooder.

H. W. HART MFG. CO., P. O. Box 404 W, Santa Monica, Calif.
More Hart Gas Brooders are being sold on the Pacific Coast than any other make.

The Semet-Solvay Ignition Arch Process for Heavy Oil

Is the most interesting water gas manufacturing development in years. It makes profitable the use of low quality oils for enrichment on an extremely flexible operating basis.

Write us for full details

SEMET-SOLVAY
ENGINEERING CORPORATION

Engineers · Contractors

40 RECTOR ST. · NEW YORK, N. Y.

Oregon Utilities Ordered to Separate Merchandising Functions

On April 20 Charles M. Thomas, public utilities commissioner of Oregon, issued an order supplementing those of March 29 and July 26, 1932, in reference to merchandising practices of public utility companies. The earlier orders required a segregation of accounting for merchandising and jobbing activities from public utility functions. Class A and B utilities by the new order are required to divorce their merchandising and jobbing activities from the regulated utility business.

The pertinent text of the April 20 order reads as follows:

"It is ordered that from and after the date hereof the activities of the employees of Class A and B utilities engaged in merchandising and jobbing shall be divorced and separated from the regulated utility business and a separate and distinct department maintained, and no employee engaged in the regulated utility business shall perform any duties for the merchandising and jobbing department, solicit or sell merchandise, or otherwise engage in jobbing activities, except the principal executive officers of the company as listed in the annual report filed by the utility with this commission."

James B. Crawford, Pioneer of the Gas Industry Passes

JAMES B. CRAWFORD, one of the founders of the Lone Star Gas Co. of Dallas, Texas, father of its present president, Robert A. Crawford, and brother of George W. Crawford, chairman of the board of directors of the same company, died at Oil City, Pa., on March 5, following a short illness.

Mr. Crawford was born on October 5, 1855, at Emlenton, Pa. He first became associated with the gas industry as accountant for the Oil City Fuel Supply Co. of Oil City, Pa., in 1883. In 1915 he became president of the United Natural Gas Co., which post he held at the time of his retirement from active service on January 1, 1917. He was interested in many other gas and oil companies, having been affiliated in an executive capacity with Ohio Fuel Supply Co., Ohio Fuel Oil Co., Pennsylvania Gas Co., Pennsylvania Fuel Supply Co., Iroquois Gas Co. and the Provincial Natural Gas Co. of Ontario, Canada. Mr. Crawford was one of the founders of the Ohio Fuel Supply Co., Lone Star Gas Co. and Western Public Service Co.

Anti-Merchandising Bills Killed in Oregon and Arizona

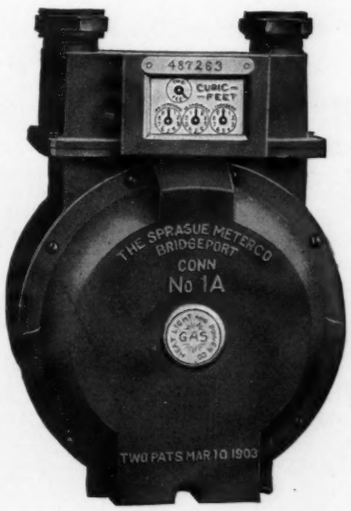
Three anti-merchandising bills presented for consideration to the Oregon Legislature have been killed in committee.

A similar bill was presented in Arizona, but was withdrawn, following an agreement between utilities and dealers of the state, whereby merchandising of small appliances will be left to dealers in cities, and utilities will sell all lines in rural territory.

Asks Eskridge, Kan., Franchise

C. B. Rose has applied for a 20-year natural gas franchise at Eskridge, Kan., supply to come from wells near the town.

"MODERNIZE as you repair"



THE SPRAGUE METER COMPANY

Bridgeport, Conn.

Los Angeles, Calif. San Francisco, Calif.

Newark, Ohio.

Davenport, Iowa. Houston, Texas.

ANOTHER

Welsbach

ACHIEVEMENT

Cook By Infra-Red Rays!

THE HOTZONE BROILER-GRIDDLE

Broiling operations and Griddle Cooking can be carried on at the same time

Heavy Cast Iron Griddle holds heat—Uniform temperature throughout entire surface

Special patented Gas Burner emanates Infra-Red rays of great penetrating power

Economical in operation—Saving in gas consumption often pays initial cost in ONE YEAR

You will want to know more about this wonderful device designed for Hotel and Restaurant use

Welsbach

COMPANY

Gloucester, N. J.

50 Hawthorne St. San Francisco

226 So. Wabash Ave. Chicago, Ill.

PAYNE

ANNOUNCES NEW

1933 PRICES AND MERCHANDISING PLAN

Write us for your Copy.

PAYNE FURNACE & SUPPLY CO.
Since 1914
Beverly Hills, California

IT'S AN ADAMS

NOW!

You Can Clean Any Pipe
THOROUGHLY • ECONOMICALLY
with the
ADAMS ROTARY PIPE CLEANING MACHINE

No other method will clean pipe as thoroughly or as economically as this electric motor driven machine ● Either old or new pipe, above the ground or in the trench ● Without disturbing service.

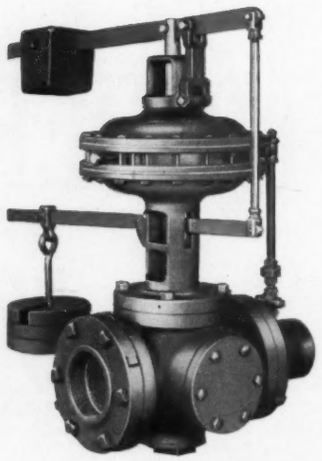
Phone or Write for Details

Adams Mfg. & Engineering Co.
2068 Belgrave Ave. Kimball 3902
Huntington Park, California

New Chaplin-Fulton Regulator For Medium Gas Pressure

A governor for the regulation of medium gas pressures without the use of pilot or auxiliary controls, is now being made by the Chaplin-Fulton Co., of Pittsburgh, Pa., as an addition to the company's line. The new device is adapted for use where gas at high inlet pressure—50 to 100 pounds or over, needs to be reduced and kept constant at 5 to 10 pounds, in the distribution system. Patterned after the Duplex Low Pressure Regulator made by the same company, this new device employs two diaphragms moving in opposite directions but exerting their power in the same direction, one being immediately connected to the valve stem, the other connected indirectly by a toggled lever which multiplies its force and reduces frictional resistance to a minimum. Such a method of operation results in great sensitiveness and power as compared with a governor using only a single diaphragm.

The Fulton Duplex Medium Pressure Regulator, as it is called, like other Fulton regulators, may be equipped with "V-port"



valves for operation under light loads. The "V-port" valve is effective for half the lift of the valves so that there is no restriction to the passage of the gas at peak loads.

"Rate Service" Inaugurated By American Gas Association

A new "Rate Service" has been established by the American Gas Association which will supersede the "A. G. A. Rate List" formerly published. The new service will be published in loose leaf form and supplementary sheets issued regularly throughout the year incorporating changes in gas rate schedules.

The new service will contain the following information:

1. Gas rates in effect on January 1, 1933, together with data on kind and heating value of gas supplied in practically every community in the United States and its possessions, Canada and Newfoundland.

2. Complete list of gas companies with names of communities supplied by each company.

3. List of gas companies having special rates for water heating.

4. List of gas companies having special rates for house heating.

5. A tabulation showing all communities in which therm rates are now in effect and the names of companies serving such communities.

This new Rate Service will contain 500 pages of information relative to gas rates throughout the country.

Republic Steel Corp. Moves Dallas Office to Houston

The Dallas, Texas, district sales office of Republic Steel Corp. has been closed and removed to 2322 Gulf Building, Houston, Texas, N. J. Clarke, vice-president in charge of sales, announced recently. R. E. Lanier, district sales manager, and his present staff will be in charge of the new Houston office.

Standard Gas and Electric Co. Reports on 1932 Earnings

A preliminary statement of Standard Gas and Electric Co., Chicago, Ill., for the 12 months ended December 31, 1932, shows net revenue of the company from its subsidiary and affiliated companies and other investments amounting to $14,028,321 against interest charges of $4,901,605, leaving a balance of $9,126,716 for preferred dividends. After payment of the preferred dividends amounting to $6,371,225 there was a balance of $2,755,491, which is equivalent to $1.27 a share on the 2,162,607 shares of common stock outstanding at the end of the period, compared with $2.40 per share for the year ended December 31, 1931. The balance of $2,755,491 includes $1,507,370 paid from surplus of the subsidiary and affiliated companies.

B. C. Electric Co. Completing Extensions; to Install Compressors

British Columbia Electric Railway Co., Ltd., Vancouver, B. C. is completing its extensions from the Victoria plant into Oak Bay, Saanich and Esquimalt, laying a total of 27.8 miles of small diameter pipe at a cost of $86,626. Two 37 h.p. compressors are to be installed in the plant at Victoria to increase the pressure for the new load.

George Gott Named District Manager for Community Natural at Hanley

George Gott, district manager for Community Natural Gas Co. at Cameron, Texas, has been transferred from Cameron to Hanley, where he will supervise activities of the company in Chico, Oak Lawn, Rhome, Saginaw, Neward, Birdville, Godley, Burleson, Lillian, Joshua, Everman, Irving, Mansfield, Trumbull, Midlothian, Britton, Palmer, and Grapevine, Texas.

DIRECTORY

Byllesby Engineering and Management Corporation

Wholly-owned subsidiary of Standard Gas and Electric Company

231 South La Salle Street, Chicago
New York Pittsburgh San Francisco

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QUIET
GENERAL MAGNETIC GAS VALVE FEATURES: Electric Hum Eliminated, ½-3" sizes. Low and High Voltage. Built for High Pressure Gas. Made in slow-opening types. Simple in Design—Infallible in Operation—Low in Price.
GENERAL CONTROLS CO., LTD.
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SHEER 31-A MOTOR GAS VALVE
Now Entering Its Third Year
LEADS IN PERFORMANCE AND LOW PRICES
Also Hi-Lo Gas Valve, Step-Opening Gas Valve, Thermostats, Safety Pilots, Limit Controls, Space Heater Regulators, Humidifiers, Etc. . . . .
WRITE FOR CATALOG
H. M. SHEER CO., QUINCY, ILL.

GAS PIPE LINE MAP

Compiled by the Editors of WESTERN GAS—Size 45" x 45"

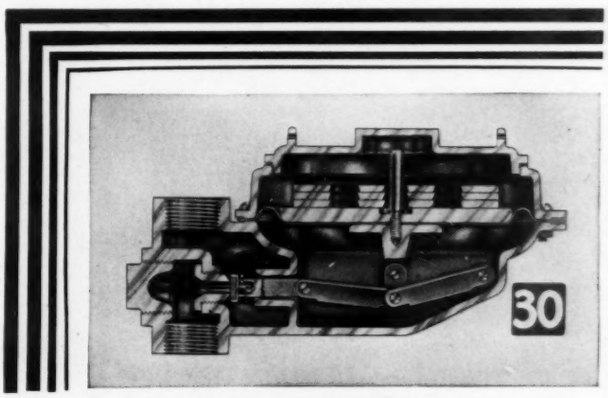
The most comprehensive published; covers the 22 western states in detail. Gives gas fields, names of natural gas communities; sizes of pipe lines and names of pipe line companies.

Prices: $1.50, Heavy Bond Paper; $3.50, Printed on Cloth

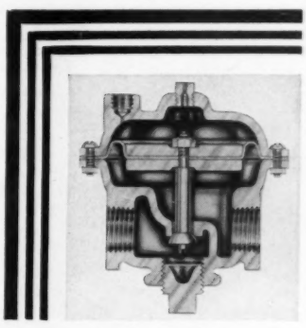
WESTERN GAS
810 South Spring St. Los Angeles, Calif.

Reynolds Regulators

give more years of operating performance and get on the service cost sheet less than any other units on the market. But there is a reason for this—Reynolds policy of manufacture, their method of examining material and testing the completed regulators assures buyers that the units bought have a prior performance that ordinarily will not be duplicated in actual performance. The hundreds of thousands of Reynolds regulators giving satisfactory performance after years of service is substantiating proof of the ability of these regulators. Reynolds engineering department is glad to co-operate in working out and solving your gas control problems. Write.



Reynolds low pressure refrigeration regulator gives consistent delivery pressure for combustion purposes regardless of varying line pressures or uneven volumes. These units are built of quality material and factory tested through a range of possible operating conditions. The record of actual performance is assurance that they will operate over a period of years without maintenance service.



● **REYNOLDS BRANCH OFFICES:** 422 Dwight Building, Kansas City, Mo.; 2nd Unit, Santa Fe Building, Dallas, Tex.
● **REPRESENTATIVES:** Eastern Appliance Co., Boston, Mass. F. E. Newberry, Avon, N. J.

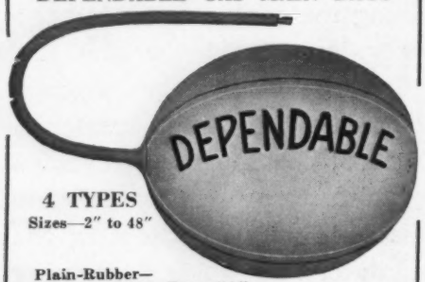
REYNOLDS GAS REGULATOR COMPANY
Anderson, Indiana, U. S. A.

GAS CONTROL SINCE 1892

THE GOODMAN STOPPER

The Reliable Shut-Off for Street Mains. Equipped with "Z" Handle and Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass.

DEPENDABLE GAS MAIN BAGS

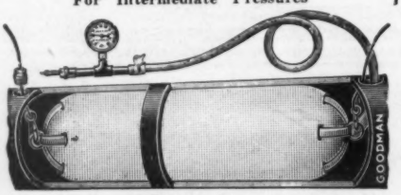


4 TYPES
Sizes—2" to 48"

Plain-Rubber—
light weight, **Type "A"**
medium weight, **Type "B"**
heavy, extra strong, **Type "D"**
Canvas-Covered, Type "C"

Goodman Cylindrical Stopper

For Intermediate Pressures



Patented

This stopper is pulled into place by cables. It will hold back more pressure than any other bag. Sizes 2 in. to 48 in.

The Gardner-Goodman Stopper

Consists of an inflatable bag mounted in brass cylinder with plunger for safe and easy insertion and comes equipped with a gauge. For use on cast iron or steel, standard, oversize or undersize mains. Easily inserted in top, bottom or side of mains, in open excavation or under pavements.

Patented

For pressure work use two or more Stoppers in parallel.
Sizes 2 in. to 20 in.

Shipments From Stock

SAFETY GAS MAIN STOPPER CO.

523 Atlantic Avenue
BROOKLYN N. Y.
Pacific Coast Rep.: C. B. Babcock Co.
135 Bluxome St., San Francisco, Calif.

Notice of Change in A. G. A. Approval Requirements for Gas Ranges

Upon recommendation of the Gas Range Sub-Committee, the A.G.A. Approval Requirements Committee has approved a number of revisions to the A.G.A. Approval Requirements for Gas Ranges (Effective March 1, 1933) to become effective May 1, 1933.

These changes require that automatic top burner lighters shall provide for complete automatic ignition of the gas on all top burners including simmering burners, within a period of 4 seconds after the gas to any such burners has been turned on full, and for automatic re-ignition when the flames on any burner are extinguished by means other than by closing the gas cock. The present provision that ignition of gas at simmering burners is optional where a manual type lighter is supplied is not affected by the foregoing revisions.

In addition, it was ruled that, where three-way top burner cocks are used on gas ranges provided with automatic top burner lighters, the incorporation of means in the gas cock assembly to indicate the "off" position by sound or feel will not be required. However, the use of such construction will be mandatory on cocks of the type indicated when they are employed on ranges requiring manual ignition or equipped with manual type lighters.

Code Covering Installation of Fittings for City Gas Is Approved

According to the April 11 bulletin of the Compressed Gas Manufacturers Association, Inc., the American Standards Association has approved a comprehensive code covering the installation, maintenance, and use in buildings of piping and fittings for city gas, following its submittal by the National Fire Protection Association. The code embraces practically every point of gas installations in buildings, from the entry of the lines into buildings to the connections to appliances. It states precautions to be observed when installing or repairing piping and provides standard methods of inspection and test to assure the safety of the installation. This includes provisions to make certain that gas burning appliances shall be installed only when there are proper ventilating appliances. The N.F.P.A. has been designated sponsor for the project under the procedure of the A.S.A. and future revisions of the code will be handled by a technical committee.

"Dictator" is New Automatic Storage Water Heater by A. G. P.

A new, gas-fired automatic storage water heater has been announced by the American Gas Products Corp., a division of the American Radiator Co. This new heater is called "The Dictator." Some of its features are: heavy blanket of rock wool insulation on sides and top; heavy cast-iron base and legs; high-lustre baked enamel jacket; heavy tank construction, galvanized under latest improved process; "snap action" thermostat; bimetallic thermostatic pilot.

The Dictator is made in 15, 20, 30 and 40 gallon sizes.

Classified Advertising

Classified advertising five cents per word; minimum $2.00 per insertion. Situation Wanted advertisements up to 50 words will be published three consecutive issues without charge. Small professional cards 1-in. deep by 21 ems wide are $6.00 monthly on 12-time contract.

SITUATIONS WANTED—MALE

Situation Wanted by House Heating Engineer; 6 years with large warm air heating corporation; for past two years has specialized on conversion gas equipment, gas furnaces and air conditioning. Capable of figuring, laying out and selling central heating systems. Age 44. Married. Address Box 231, *Western Gas,* 810 South Spring St., Los Angeles, Calif.

Meter repairman with four years experience in meter repairing, both tin and iron case, large and small capacity meters, desires permanent connection with reliable company. References. Address Box E-233, *Western Gas,* 810 South Spring Street, Los Angeles, Calif.

Central States Gas Utilities Authorized to Purchase Macon Co.

Central States Gas Utilities Co., Kansas City, Mo., affiliated with Panhandle Eastern Pipe Line Co., has been given permission by the Missouri public service commission to purchase the capital stock of the Macon Gas and Electric Co., Macon, Mo., of which John F. Barnard is president. The company serves water gas in Macon through approximately 300 meters.

Northwest States Utilities Co. Reconstructing Distribution System

Northwest States Utilities Co., Missoula, Mont., expected to begin reconstruction of parts of its distribution system at Missoula about April 15. It is reported that some of the system will be enlarged in preparation for the coming of natural gas with the return of normal business conditions. Work of reconditioning the system will be under the direction of George Rawie, construction superintendent for the company, headquartered at Great Falls, Mont.

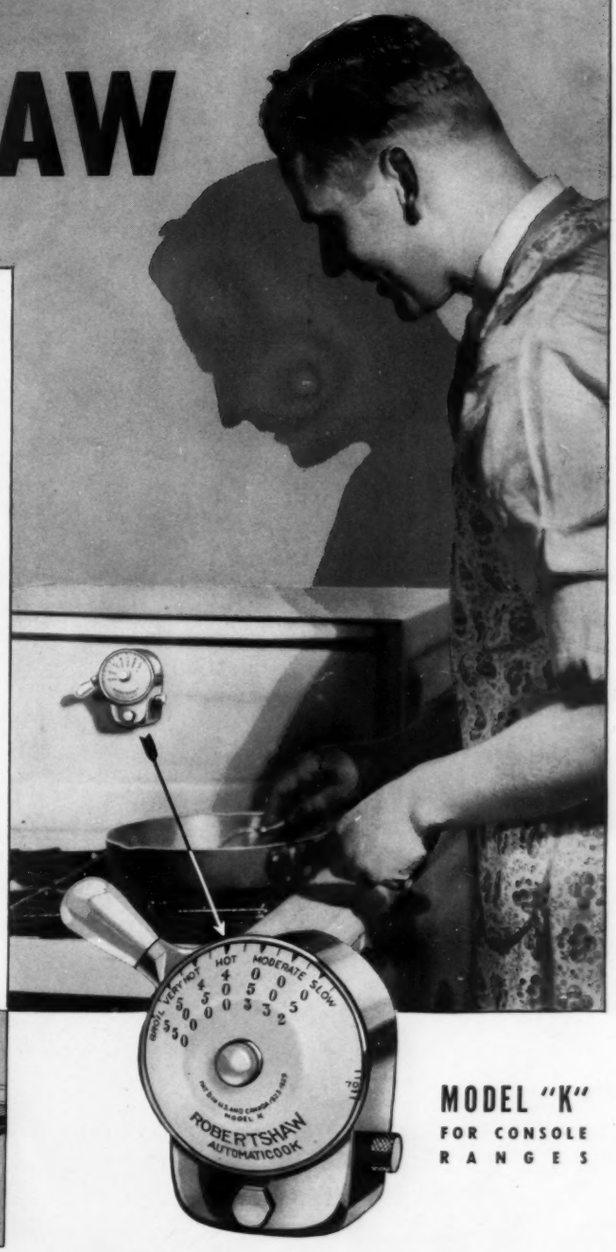
Illinois P. & L. Corp. May Change Over Galesburg System

Illinois Power & Light Corp., Galesburg, Ill., will change over to natural gas if the proposition tendered that company by Natural Gas Pipeline Co. of America for supplying the gas is accepted. The company has nearly 10,000 meters at Galesburg. To complete the project it would be necessary for Natural Gas Pipeline Co. of America to construct a 30-mile extension from the main line, near Orion.

Any Man Can Cook

with a

ROBERTSHAW

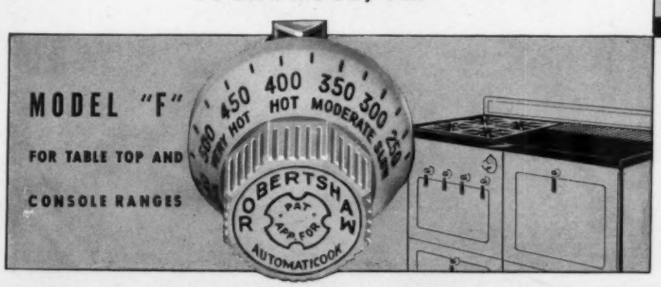


● Although it is the woman who takes the initiative in the buying of a new gas range, the decision is seldom made until it has also met the approval of the man of the house. And the one thing that justifies a new range to most men is the Robertshaw Oven Control.

● The man who insists on automatic temperature control in the cooling and lubricating system of his car, and in the maintenance of his furnace, is quick to see the good sense of automatic oven control . . . the freedom it gives his wife from kitchen drudgery . . . the certainty of better cooking and the economy of correct use of foods. When a man is sold on a device of that kind, he also wants to make sure that it is the best engineered device for the purpose.

● No man . . or woman . . who knows the Robertshaw record for trouble-free performance on more than 1,700,000 ranges wants to take any chances with makeshift, unknown, "just-as-good" oven controls. Be sure *now* that you have a representative showing of Robertshaw equipped ranges and have your sales people "all set" to demonstrate the Robertshaw to every gas range prospect. It's the best way, you know, to sell *good* ranges at *profit-making* prices.

ROBERTSHAW THERMOSTAT COMPANY
YOUNGWOOD, PA.



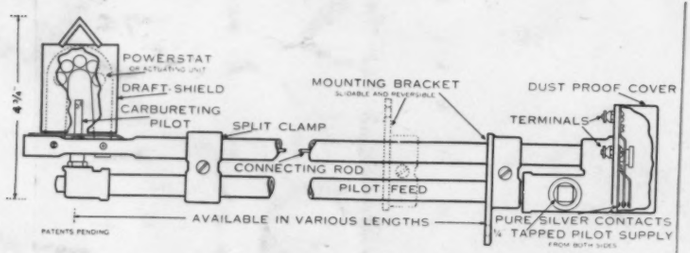
MODEL "K"
FOR CONSOLE RANGES

ROBERTSHAW

"AutomatiCook"

Out of the depression came-

PowerStat



FOR years everyone connected with the Gas Industry has realized the need for a DEPENDABLE Automatic Pilot Control.

It is here. It is called POWERSTAT. Originating in the laboratories of Watrola Corporation, it is offered today as a perfected device, having satisfactorily met the exhaustive tests of the most skeptical authorities.

The outstanding characteristic of *POWERSTAT* is its *unfailing dependability.* Combined with an unusually economical pilot burner, it should prove a decided factor in the salability of gas appliances to which it is applied.

With its dependability already established in actual use on several well known appliances, *POWERSTAT* is attracting wide and favorable attention throughout the industry.

Investigate *POWERSTAT* today. An illustrated folder with full description will be mailed on request.

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★ POWERSTAT is not a thermostat. It is a mono-metal robot, which, as contrasted with a bi-metal thermostat, has the characteristics of a movement of 30-thousandths, with a complete cycle within 20 seconds. With practically unvarying speed under widely varying temperatures it has a pulling power of 30 to 50 pounds. It has no fatigue point within the temperature of ordinary fireboxes. It forms the activating control member in conjunction with a new carbureting pilot light burner of unusual stability and economy. It has the inherent ability of purging itself of gas gum.

PS The last word in automatic control!